

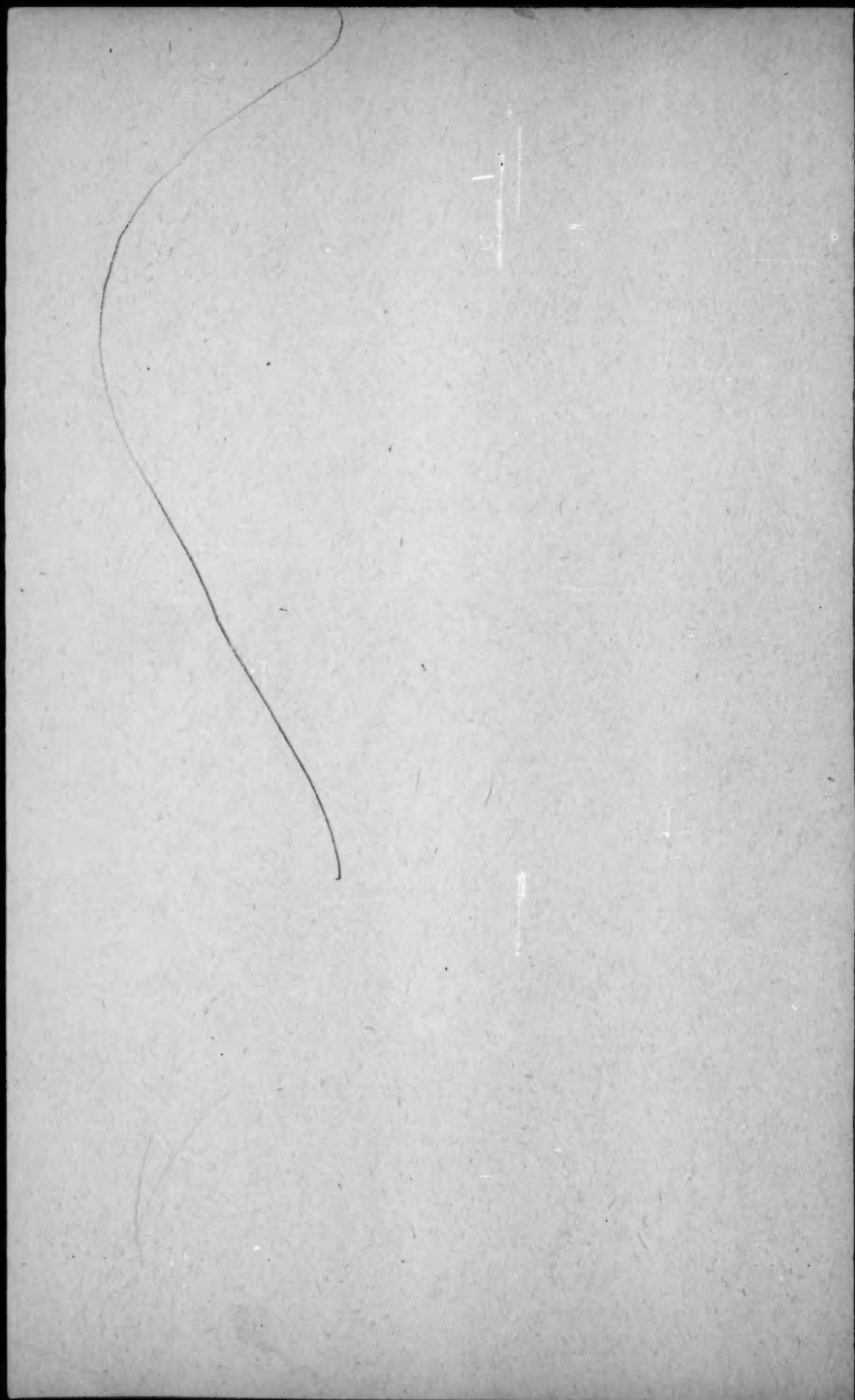
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CALCIUM, PHOSPHORUS, AND NITROGEN OF NURSERY-SCHOOL LUNCHES

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A knowledge of the composition of nursery-school diets is of importance if the daily intake is to be adequate. Studies of this nature are few; estimated values rather than determined values are given.

A previous study from this laboratory (4) reported on the determined (reduced and total) ascorbic acid, carotene, and vitamin A values of nursery-school diets served the older and younger groups of children. This study found that, even without the inclusion of "seconds" which were available to all of the children, the nursery-school food analyzed provided vitamin A, carotene, and total ascorbic acid in excess of that necessary in one meal even when that meal is the noon meal of the day. However, preliminary studies done previously indicated low values for nitrogen, calcium, phosphorus, iron, and copper in nursery-school lunches (2). Consequently, the present study was undertaken to determine the calcium, phosphorus, and nitrogen content of nursery-school foods over a longer period of time and involving a larger number of children.

PROCEDURE

The study covered a five-day week in each of two successive summers, 1949 and 1950, and involved a total of 31 children enrolled in the North Texas State College Nursery School.

The technique of collecting and preserving a serving of food from each group as well as the sampling of the milk and mid-morning tomato juice was reported by Tomkins and Scoular (4).

Nitrogen was determined by the macro-Kjeldahl method and calculated as protein. The calcium and phosphorus were each determined gravimetrically, the former as calcium oxalate ignited to calcium oxide and the latter as ammonium phosphomolybdate.

RESULTS

The children were served in two groups; the older group included children between 48 and 57 months during 1949 and between 47 and 55 months during 1950, while the younger group varied from 30 to 42 months in 1949 and 32 to 43 in 1950. This slight difference in age ranges for the two study periods is not great enough to influence the amount of food consumed by

¹ Data submitted in partial fulfillment of Master's Degree in Foods and Nutrition.

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the individuals. Individual needs and differences are expressed in the number and kind of second servings eaten by each child.

The food for each group was identical in every respect to the plate served each child in each group since the sampling was done at the time the plates were served each child. Then the mid-morning tomato juice was

TABLE I
CALCIUM CONTENT OF NURSERY SCHOOL LUNCHES
DURING TWO FIVE-DAY PERIODS

Date	MILLIGRAMS CALCIUM IN COMPOSITE FOOD SAMPLES AND IN MILK YOUNGER GROUP			OLDER GROUP		
	Food*	Milk†	Total	Food*	Milk†	Total
7-26-49	47.8	177.4	225.1	51.1	188.8	240.0
7-27-49	45.0	177.4	222.4	58.7	188.8	267.5
7-28-49	203.7	177.4	381.1	413.2	188.8	602.1
7-29-49	86.3	177.4	263.7	62.3	188.8	251.1
7-30-49	61.7	177.4	239.1	163.9	188.8	352.7
Ave./dy.	88.9	177.4	266.3	149.8	188.8	342.7
7-20-50	72.8	150.8	223.6	88.8	153.0	241.9
7-21-50	56.0	150.8	206.8	95.8	153.0	248.9
7-22-50	124.4	150.8	275.3	144.1	153.0	297.2
7-25-50	161.3	150.8	312.1	183.9	153.0	336.9
7-26-50	46.2	150.8	197.0	46.9	153.0	199.4
Ave./dy.	92.1	150.8	243.0	111.9	153.0	265.0
National Research Council's Recommended Daily Allowance			1000.0	1000.0		

* Includes mid-morning fruit juice.

† Milk determined in two five-day composite samples.

added to each of the two composites (older and younger groups') and the food was ready for analysis.

The original servings of each food for each group were very small as each child was expected to eat all of this, presenting a clean plate. He then could have as many second servings of one or all foods as he could eat.

The determined calcium, phosphorus, and nitrogen (protein) values were from the original plate serving. On this basis, Table I shows the calcium determination for the two five-day periods.

Calcium. The calcium furnished by the composite food as reported by the plate lunch for the older group varied from 51 to 413 mg. and for the younger group from 45 to 204 mg. The lowest values in each case were

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associated with individual foods low in calcium or combination protein dishes as macaroni and cheese. The highest daily intake for each group occurred when a green vegetable salad was included in the meal. The total calcium intake which included the composite food plus the milk varied from 222 to 381 mg. with an average of 266 mg. for the younger group and from

TABLE 2
PHOSPHORUS CONTENT OF NURSERY SCHOOL LUNCHESES
DURING TWO FIVE-DAY PERIODS

Date	Milligrams Phosphorus in Composite Food Samples and in Milk					
	YOUNGER GROUP			OLDER GROUP		
	Food*	Milk†	Total	Food*	Milk†	Total
7-26-49	105.9	155.2	261.1	152.6	165.4	318.1
7-27-49	100.7	155.2	255.9	130.6	165.4	296.0
7-28-49	44.4	155.2	199.6	80.4	165.4	245.8
7-29-49	30.0	155.2	185.2	42.1	165.4	207.5
7-30-49	54.1	155.2	209.3	128.0	165.4	293.5
Ave./dy.	67.0	155.2	222.2	106.7	165.4	272.2
7-20-50	13.9	122.2	136.1	15.2	138.5	153.7
7-21-50	46.5	122.2	168.7	51.9	138.5	190.4
7-22-50	186.2	122.2	308.4	191.5	138.5	330.0
7-25-50	137.5	122.2	259.7	143.4	138.5	281.9
7-26-50	37.9	122.2	160.1	44.4	138.5	182.9
Ave./dy.	84.4	122.2	206.6	89.3	138.5	227.8
National Research Council's Recommended Daily Allowance			1000.0	1000.0		

* Includes mid-morning fruit juice.

† Milk determined in two five-day composite samples.

240 to 602 with an average of 343 mg. of calcium for the older group. The daily intake of calcium from milk alone was 177 mg. for the younger and 189 mg. for the older group.

Phosphorus. The lowest phosphorus content of the lunches for the 1949 composite foods are given in Table 2; they were 30 mg. for the younger and 42 mg. for the older group. These values occurred with salmon salad as the only protein food other than the milk which was analyzed separately. The highest intake of phosphorus was 106 mg. for the younger and 153 mg. for the older group with a luncheon dish of macaroni and cheese. The total intake for the younger group, with milk furnishing 155 mg. per serv-

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ing, varied from 185 to 261 mg. with an average of 222 mg., and from 208 to 318 mg. with an average of 272 mg. for the older group with milk furnishing 165 mg. of the phosphorus.

In 1950 the lowest composite was 14 mg. for the younger and 15 mg. for the older, the highest 186 and 192 mg., respectively. The highest total phosphorus intakes of 308 mg. for the younger and 330 mg. for the older were obtained when baked cheese croquettes, spinach, salad, black-eyed

TABLE 3
PROTEIN CONTENT OF NURSERY SCHOOL LUNCHES
DURING TWO FIVE-DAY PERIODS

Date	Grams Protein in Composite Food Samples and in Milk					
	YOUNGER GROUP			OLDER GROUP		
	Food*	Milk†	Total	Food*	Milk†	Total
7-26-49	3.49	3.57	7.06	5.68	4.25	9.93
7-27-49	5.70	3.57	9.28	7.57	4.25	11.82
7-28-49	4.80	3.57	8.37	8.48	4.25	12.73
7-29-49	6.37	3.57	9.94	8.24	4.25	12.49
7-30-49	1.86	3.57	5.43	2.69	4.25	6.94
Ave./dy.	4.45	3.57	8.02	6.53	4.25	10.78
7-20-50	1.89	2.66	4.55	2.91	2.86	5.77
7-21-50	2.18	2.66	4.85	3.02	2.86	5.88
7-22-50	2.56	2.66	5.22	3.59	2.86	6.45
7-25-50	2.17	2.66	4.83	3.48	2.86	6.34
7-26-50	6.76	2.66	9.42	7.33	2.86	10.19
Ave./dy.	3.11	2.66	5.78	4.07	2.86	6.92
National Research Council's Recommended Daily Allowance			40.00			50.00

* Includes mid-morning fruit juice.

† Milk determined in two five-day composite samples.

peas, and apricot- whip were served. The total noon lunch furnished from 136 to 308 mg. with an average of 207 mg. for the younger group and 154 to 330 mg. with an average of 228 mg. for the older group.

Protein. The protein during 1949 varied from that during 1950 (Table 3) just as the calcium and phosphorus varied. The lowest intake during the first five-day period was 1.86 gm. protein and the highest, 6.37 gm. for the younger group and a range of 2.69 to 8.48 gm. for the older group; milk furnished the two groups of children 3.57 and 4.25 gm. of protein,

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respectively. The total protein intake varied from 5.43 to 9.94 gm. for the younger and from 6.94 to 12.73 gm. for the older group.

During 1950 these composite food values ran from 1.89 to 6.76 gm. for the younger and 2.91 to 7.33 gm. for the older group. The milk protein was less than in 1949, 2.66 gm. for the younger and 2.86 gm. for the older. The composites and milk give the younger group a total of 4.55 to 9.42 gm. and the older group from 5.77 to 10.19 gm. of protein.

TABLE 4
PERCENTAGES OF NOON MEAL CALCIUM, PHOSPHORUS, AND PROTEIN
PROVIDED BY MILK AND THE PERCENTAGE OF THE NATIONAL
RESEARCH COUNCIL'S RECOMMENDED DAILY ALLOWANCE
PROVIDED BY THE NOON MEAL

Nutrient	Younger Group		Older Group	
	Percentage Contribution of Milk to Noon Meal	Percentage Contribution of Noon Meal to Daily Allowance	Percentage Contribution of Milk to Noon Meal	Percentage Contribution of Noon Meal to Daily Allowance
1949				
Calcium	67	27	55	34
Phosphorus ..	70	22	61	27
Protein	45	20	39	22
1950				
Calcium	62	24	58	27
Phosphorus ..	59	21	61	23
Protein	46	14	41	14

DISCUSSION

Calcium. The calcium of the milk provided from 66 to 62 per cent of the noon meal calcium for the younger group and 55 and 56 per cent for the older group in 1949 and 1950 respectively. According to Steggarda and Mitchell (3) milk should supply one-half to two-thirds of the daily calcium for best utilization, and our values fall within this range. Referring to Table 1, the average nursery-school lunch analyzed gave a total of 266 and 243 mg. of calcium for the younger group and 343 and 265 mg. for the older group for these two summer periods. Table 4 shows these values calculated on the basis of the percentage of calcium provided by milk and the percentage of the National Research Council's Recommended Daily Allowance provided by the noon meal. It is assumed that the noon meal is the largest meal consumed by pre-school age children. On this basis the noon meal will usually supply more than a third of the day's requirements.

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In only one instance was a third of the day's calcium supplied by the initial servings of the noon meal and that was for the older group in the summer of 1949. For the others the average is about one-fourth of the day's recommended allowance.

Phosphorus. Similarly, a comparison of the phosphorus intakes provided by milk and the percentage of the total day's allowance of phosphorus provided by the noon meal is obtained from Table 4. The younger group re-

TABLE 5
NUMBER OF SECOND SERVINGS OF PROTEIN-RICH FOODS AND OF
MILK CONSUMED BY EACH GROUP OF CHILDREN

Date	Younger Group			Older Group		
	Protein-Rich Foods	Milk	Total	Protein-Rich Foods	Milk	Total
7-26-49*	5	6	11	6	7	13
7-27-49	4	6	10	4	2	6
7-28-49	6	6	12	3	4	7
7-29-49	7	6	13	4	6	10
7-30-49	5	6	11	3	9	12
Ave./dy.	5.4	6	11.4	4	5.6	9.6
7-20-50†	7	2	9	2	1	3
7-21-50	3	4	7	0	0	0
7-22-50	5	3	8	0	0	0
7-25-50	5	3	8	5	0	5
7-26-50	5	2	7	3	0	3
Ave./dy.	5	2.8	7.8	2	0.2	2.2

* Period I, Number of children in younger group—8, number of children in older group—8.

† Period II, Number of children in younger group—7, number of children in older group—8.

ceived more phosphorus from milk in 1949 than in 1950, namely, 70 per cent as compared to 59 per cent. The older group received the same percentage each time, 61 per cent. The percentage of the day's recommended allowance of phosphorus was less than that of calcium for both groups of children, 22 and 21 per cent for the younger and 27 and 23 per cent for the older.

Protein. The percentage of protein furnished by the milk consumed (Table 4) was less than the percentage of calcium or phosphorus contributed by milk to the noon meal. The percentage of protein contributed by

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the noon meal to the daily recommended allowance was the least of the elements analyzed, 20 and 14 per cent of the younger group's and 22 and 14 per cent of the older group's requirement.

It is necessary to remember that the above percentages and values represent that of the plate serving and do not include "seconds." Table 5 gives the number asking for and receiving "seconds" of milk and the protein-rich foods on the menus. During the summer of 1949, there were eight children in the younger group and eight in the older group while in 1950 the groups contained seven and eight respectively. It is evident from the number of second servings of milk in the summer of 1949 that nearly every child of the younger group had a second serving of milk. This would provide the child with approximately one-half of his day's requirement of calcium at the noon meal. However, if he did not have the additional serving of milk, the other two meals of the day must furnish from two-thirds to three-fourths of his calcium requirement.

The phosphorus intake will likewise be increased by an additional serving of milk to approximately one-third of the day's requirement although milk contains less phosphorus than calcium. Without this extra serving the other meals of the day must supply more phosphorus than calcium. Phosphorus is also available from the protein-rich foods served as the main dish as well as from the beverage milk. From Table 5 it is evident that "seconds" of the protein-rich foods were less uniform from day to day for the younger group; the older group varied even more than the younger group in "seconds" of both milk and the protein-rich foods. It is apparent that the older group would on an average receive less of calcium and phosphorus from the noon lunches than the younger group because of this difference in second servings.

Both milk and the protein-rich foods are the chief sources of the protein in the nursery-school lunches. From Tables 4 and 5 it is evident that the protein intakes vary most and fail more than the others to approach the day's recommended allowances.

Lamb and Ling (1) in a study of the food consumption and preferences of nursery-school children reported that, although the estimated (evaluation of food-consumption records but no analysis of foods) nutrient intake may be adequate, the child's consumption of certain food groups can still fall short of the recommended amounts. These authors report that their group of children liked least of all the yellow and green vegetable group of foods. Our previously reported analysis of carotene and vitamin A of nursery-school lunches (4) showed that the consumption of this group of foods by children in the nursery school used in the present study more than supplied their daily needs at the one meal. And while Lamb and Ling reported that their subjects did not neglect the protein-rich foods, in our present study these foods were neglected especially by the older group of children when "seconds" were requested.

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SUMMARY

Lunches served nursery-school children during two five-day periods, one in the summer of 1949 and the other in the summer of 1950, were analyzed for their calcium, phosphorus, and protein content.

The initial serving of food provided an average of 243 to 266 mg. of calcium for the younger group and 265 to 343 mg. for the older group.

The phosphorus analyses gave the average of 207 to 222 mg. for the younger group and 228 to 272 mg. for the older group.

The protein content of these same meals averaged 5.78 to 8.02 gm. for the younger and 6.92 to 10.78 gm. for the older group.

The milk served as a beverage was analyzed separately from the plate lunches. Milk contributed to the noon meal, during the summer of 1949, 55 and 67 per cent of the calcium, 61 and 70 per cent of the phosphorus, and 39 and 45 per cent of the protein. During 1950 the contribution was 58 and 62 per cent of calcium, 59 and 61 per cent of phosphorus, and 41 and 46 per cent of protein.

The combination of the plate food and the beverage milk provided in 1949 from 27 to 34 per cent of the calcium, 22 to 27 per cent of the phosphorus, and from 20 to 22 per cent of the protein of the National Research Council's recommended daily allowance. In the following year these percentages were: 24 and 27 per cent of the calcium, 21 and 23 per cent of the phosphorus, and 14 per cent of the protein.

When the milk "seconds" are considered, one may assume that the calcium intake is adequate for the noon meal which is the child's largest meal. The adequacy of the phosphorus and protein, however, will be dependent upon the choice of additional servings of protein-rich foods.

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STUDIES ON THE BODY SIZE OF NORTH AMERICAN CHILDREN OF MEXICAN ANCESTRY

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The North American "melting pot" simmers slowly, so slowly that for many years to come it will contain a number of recognizable morphologic concentrations. These concentrations are described appropriately as smaller composites within the aggregate, i.e., as sizable clusters resulting from differential combinations of such variables as genetic heritage, geographic habitation, and those phases of social heritage which relate to health care, activity regimen, and dietary consumption.

Students of child development have given considerable attention to the physical growth of certain subgroups (e.g., North American children of northwest European descent) and only meager attention to the physical growth of other subgroups (e.g., North American children of Chinese, Indian, and Mexican lineage). This fact has been revealed with particular force in publications that have colligated investigations for special age periods or growth topics (10, 12, 14, 22, 13, 11).

The present paper pertains to the body size of that subdivision of the North American child population identified as "Mexican." Ethnically, a typical Mexican child is a descendant from sixteenth century admixture of southwest European progenitors and American Indian progenitors, with the latter predominating. There are, however, "very considerable differences in the amounts of Indian and white blood in the Mexican population" (19, p. 3).¹

The studies brought together are partly original and partly those of other investigators. They represent groups of Mexican children residing in central and northern Mexico and in the southwestern region of the United States. Among the aspects of body size considered are weight, stature, stem length, arm span, and 4 dimensions each of the head and neck, the trunk, and the extremities. The age period covered begins at birth and extends to 17 years.

INFANCY

Goldstein assembled anthropometric records on two groups of infants of Mexican ancestry, one group residing in Guanajuato, Mexico, and the other

¹ To quote from an earlier paper by Goldstein: "... the bulk of the Mexican population is *mestizo*, a mixture of European (mostly Spanish) and American Indian ... the European-Indian admixture is generally old, probably beginning in the early sixteenth century ... the Indian line no doubt was and still is the predominant one in the miscegenation process, especially among the lower economic groups" (2, pp. 12, 46).

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in San Antonio, Texas. Measurement of both groups took place within the period 1939-42.²

In Mexico, data for body weight, stature, and chest girth were "culled from the pediatric records of an infant-care clinic in the city of Guanajuato" (3, p. 3). The Texas data were measurements of body weight and stature taken by "public health nurses . . . in well-baby clinics" (3, p. 3). For both series, examinations occurred at birth and on successive occasions during infancy. More infants were examined in the early postnatal months than at later infancy ages, and records of body weight were obtained at more examinations than records of stature and chest girth. Table 1 shows the specific number of measurements for each city, trait, sex, and age.

TABLE 1
NUMBER OF RECORDS ON INFANTS OF MEXICAN DESCENT MEASURED
1939-42 AT CLINICS IN MEXICO AND TEXAS

Age	GUANAJUATO RECORDS						SAN ANTONIO RECORDS			
	Weight		Stature		Chest Girth		Weight		Stature	
	M*	F*	M	F	M	F	M	F	M	F
Birth	57	60	87	85	85	81	42	51	6	3
1 mo.	77	79	45	32	39	38	30	42	23	30
3 mos.	90	86	41	35	37	33	42	43	17	18
6 mos.	81	71	31	17	23	20	42	47	11	23
9 mos.	66	53	21	12	17	11	36	39	17	16
12 mos.	48	49	26	11	22	10	29	29	13	8
24 mos.	16	16	3	7	..	..	8	5	5	3

* M = males, F = females.

The economic status of the families, "both in Guanajuato and in San Antonio, was grievously low" (3, pp. 3-4). The San Antonio files carried numerous notations such as "lack of food in house" and "baby looks hungry, needs more food." Without minimizing the existence of these "gross inadequacies," it should be appreciated that on the whole the economic circumstances of the Texas families were "better than those in Guanajuato" (3, pp. 4-5).

An analysis of the neonatal records for both groups was published by Goldstein in 1947 (3). Statistics from this paper, together with statistics at ages 1, 3, 6, 9, 12, and 24 months, are given in Table 2. The basic data rep-

² Acknowledgement is made for the generous cooperation of Dr. Roberto Torres Guerrero, Director of the Centro de Asistencia Materno-Infantil of Guanajuato, and of Katherine King Baker, Director of the Division of Public Health Nursing of San Antonio.

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TABLE 2

STATISTICS (MEANS, FOUR PERCENTILES, AND EXTREME VALUES) FOR INFANTS OF MEXICAN ANCESTRY (BOTH SEXES). DATA COLLECTED 1939-42 AT CLINICS IN GUANAJUATO, MEXICO, AND SAN ANTONIO, TEXAS

Age	N	Mean	Minimum	P ₁₀	P ₅₀	P ₉₀	P ₉₅	Maximum
GUANAJUATO: WEIGHT (KG.)								
Birth	117	3.05	2.25	2.67	2.86	3.24	3.57	4.00
1 mo.	156	3.81	2.15	3.18	3.57	4.12	4.51	5.40
3 mos.	176	5.23	2.90	4.16	4.83	5.73	6.28	7.20
6 mos.	152	6.51	3.25	5.14	5.89	7.18	7.86	9.15
9 mos.	119	7.04	3.75	5.64	6.30	7.58	8.53	10.38
12 mos.	97	7.36	3.95	6.03	6.92	7.97	8.97	9.50
24 mos.	32	10.12	6.10	8.55	9.45	10.74	11.70	13.05
GUANAJUATO: STATURE (CM.)								
Birth	172	50.0	38.8	47.2	48.6	50.7	52.8	59.7
1 mo.	77	53.0	46.2	49.7	51.8	54.3	56.3	61.8
3 mos.	76	59.5	51.7	55.1	57.6	61.7	64.3	70.5
6 mos.	48	65.1	54.9	59.6	62.6	67.2	69.8	79.1
9 mos.	33	69.6	63.5	64.7	68.2	71.4	74.6	80.7
12 mos.	37	70.6	63.9	65.4	69.0	71.9	74.8	79.7
24 mos.	10	79.6	....	....	....	....	....	....
GUANAJUATO: CHEST GIRTH (CM.)								
Birth	166	36.4	30.6	33.1	34.8	36.9	38.7	47.8
1 mo.	77	38.3	31.7	34.2	37.0	39.4	42.1	48.1
3 mos.	70	42.1	34.9	38.9	40.5	43.9	46.4	50.3
6 mos.	43	44.8	36.8	40.4	43.0	46.3	49.0	53.0
9 mos.	28	46.1	38.1	42.3	44.5	47.5	51.8	55.2
12 mos.	32	46.7	39.4	42.6	44.9	48.1	50.5	56.6
SAN ANTONIO: WEIGHT (KG.)								
Birth	93	3.31	2.27	2.73	3.07	3.64	3.88	4.54
1 mo.	72	3.73	2.49	2.97	3.38	4.10	4.52	5.19
3 mos.	85	5.24	2.30	4.11	4.91	5.67	6.28	7.94
6 mos.	89	6.89	3.88	5.61	6.24	7.46	8.30	9.64
9 mos.	75	7.93	5.16	5.90	7.35	8.72	9.23	11.34
12 mos.	58	8.89	6.12	7.08	8.28	9.56	10.49	11.89
24 mos.	13	11.54	....	....	....	....	....	....
SAN ANTONIO: STATURE (CM.)								
Birth	9	49.5	....	....	....	....	....	....
1 mo.	53	52.6	48.3	49.2	51.6	53.9	55.9	58.7
3 mos.	35	58.8	51.6	55.1	57.6	60.6	63.1	65.8
6 mos.	34	64.3	57.4	60.5	62.2	65.4	68.9	71.4
9 mos.	33	68.5	63.0	65.0	67.2	70.1	72.0	74.7
12 mos.	21	70.3	64.3	66.0	69.1	71.7	74.8	77.5
24 mos.	8	84.4

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resent body weight "with the infant nude"; stature "by means of a standard pedometer"; and chest girth "at the level of the nipples" (3, pp. 5-6). Central tendency and variability values were computed with the data subgrouped according to sample, measurement, and age.

Discussion of the entire contents of Table 2 would require several pages and involve needless duplication. It will suffice to cite and illustrate different kinds of information that the table affords:

1. *Average size at each age studied.* Mean weight on the Guanajuato series of newborn infants is 3.05 kg. Corresponding neonatal means for stature and chest girth are 50.0 cm. and 36.4 cm. respectively.

2. *Variability in size at each age studied.* The weight distribution for the San Antonio sample of neonates extends from 2.27 kg. to 4.54 kg., with the lowest 10 per cent of the frequencies below 2.73 kg., the middle 40 per cent between 3.07 kg. and 3.64 kg., and the highest 10 per cent above 3.88 kg.

3. *Increase in size with advance in age.* On Guanajuato infants, the weight mean at 6 months exceeds the neonatal mean by 3.46 kg. (133 per cent), while the mean at 1 year exceeds that at 6 months by 0.85 kg. (13 per cent). Parallel increases are 15.1 cm. (30 per cent) and 5.5 cm. (8 per cent) for stature, 8.4 cm. (23 per cent) and 1.9 cm. (4 per cent) for chest girth.

4. *Intercomparison of the two mestizo samples.* At age 3 months, the Guanajuato and San Antonio distributions for weight practically are identical (note especially the means and the limits within which 80 per cent of the frequencies are dispersed). Beyond this age there is evidence that growth in weight proceeded at different rates in the two groups, e.g., at 1 year of age 30 per cent of the San Antonio distribution extends beyond the upper limit of the Guanajuato distribution, and the difference in means is 1.53 kg.³

5. *Comparison with other groups of infants.* Vickers and Stuart (23) studied a series of non-Mexican infants enrolled in a Massachusetts well-baby clinic. The infants were "of Northern European stock" and "of low to middle economic circumstances" (23, p. 156). In relation to this series, the Guanajuato infants are somewhat smaller in early infancy and markedly smaller in late infancy. At the close of the first postnatal year the stature means differ by more than 4.0 cm. and the weight means by more than 2.5 kg.

The Departamento de Asistencia Infantil de México (1) supplies a type-written table which carries weight and stature means for Mexican infants of each sex. The table states only that it was derived from "estudios en niños mexicanos."

For comparison with these Departamento means, it was possible to compute means for each sex from the Guanajuato records enumerated in Table

³ We suspect that in addition to the difference in level of nutritional inadequacy, the rate and severity of infant morbidity was greater in the Guanajuato sample than in the San Antonio sample.

TABLE 3

MEANS FOR BODY WEIGHT AND STATURE ON TWO SAMPLES
OF INFANTS OF MEXICAN LINEAGE

	WEIGHT (kg.)				STATURE (cm.)			
	Departamento*		Guanajuato [§]		Departamento		Guanajuato	
	Males	Females	Males	Females	Males	Females	Males	Females
Birth	3.10	3.10	3.12	2.98	50.3	50.3	50.3	49.8
1 mo.	3.90	3.85	3.88	3.75	53.5	53.0	53.2	52.8
3 mos.	5.44	5.20	5.39	5.06	60.0	59.5	60.1	58.7
6 mos.	7.22	7.05	6.72	6.27	64.5	64.0	65.5	64.2
9 mos.	8.40	8.15	7.16	6.78	69.0	67.0	71.1	67.3
12 mos.	9.30	9.10	7.44	7.29	72.0	70.0	70.9	69.8
24 mos.	11.50	11.50	10.40	9.83	80.0	77.0	....	....

* Departamento de Asistencia Infantil de México.

[§] 1939-42 data culled from the records of an infant-care clinic at Guanajuato, Mexico.

1. The two series of weight and stature averages, each specific for age and sex, are juxtaposed in Table 3. It will be seen that,

1. In mean weight, the Departamento and Guanajuato male infants are similar at birth and at 1 month, differ by 0.5 kg. at 6 months, and differ by 1.8 kg. at 1 year. There is a like trend of divergence with age for the two series of females, the Guanajuato series again being the lighter at 1 year by 1.8 kg.

2. In mean stature, the Departamento and Guanajuato samples register no systematic difference. There are agreements within 0.3 cm. at 1, 6, 9, and 12 months for females; and at birth, 1 and 3 months for males. (The male differences at 6 and 12 months are 1.0 cm. in opposite directions.)

3. As in studies of many other ethnic groups, comparable means on each sex from these Mexican samples show that the average male is slightly taller and heavier than the average female during the first 2 years of postnatal life.

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In a study concerned principally with problems of adult size on people of Mexican descent, Goldstein (2) sampled by families and obtained protocols that included measurements on children 3 to 17 years of age.⁴ An analysis of these data, collected during 1941-42, was made for inclusion in this report.

The data were accumulated partly in central and northern Mexico (Celaya and Guanajuato in Guanajuato, Monterrey in Nuevo Leon, and Saltillo in

⁴ Acknowledgement is made to the Institute of Latin-American Studies at the University of Texas for financial support in gathering the data.

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TABLE 4

MEANS FOR SIX MEASUREMENTS OF BODY SIZE ON CHILDREN OF
MEXICAN DESCENT RESIDING IN MEXICO AND TEXAS.
DATA ON BOTH SEXES COLLECTED 1941-42

<i>Age</i> (yrs.)	<i>N</i>	<i>Weight</i> (kg.)	<i>Stature</i> (cm.)	<i>Head</i> <i>Length</i> (cm.)	<i>Head</i> <i>Width</i> (cm.)	<i>Face</i> <i>Height</i> * (cm.)	<i>Face</i> <i>Width</i> (cm.)
		M	E X	I C O			
3	13	13.5	85.6	....	....	....	....
4	11	15.4	95.3	16.4	13.5	....	10.9
5	17	17.0	100.6	16.8	13.6	....	11.1
6	20	18.8	106.7	16.9	13.9	9.5	11.3
7	17	20.3	111.4	16.9	13.8	9.8	11.4
8	24	21.9	115.2	17.1	13.8	9.9	11.5
9	19	26.0	124.2	17.2	13.9	10.2	11.8
10	30	28.0	127.8	17.5	14.0	10.5	11.9
11	19	29.4	132.7	17.4	14.1	10.4	12.1
12	29	34.4	138.9	17.8	14.2	10.6	12.3
13	28	36.4	141.7	17.9	14.2	11.0	12.4
14	30	41.2	149.9	17.8	14.3	11.3	12.7
15	25	46.2	152.4	18.0	14.3	11.4	12.9
16	36	47.2	156.3	18.1	14.5	11.5	13.0
17	33	51.3	158.4	18.3	14.5	11.7	13.0
		T	E X	A S			
3	6	14.8	90.6	....	....	....	....
4	12	16.2	97.4	17.0	13.5	....	11.0
5	14	17.6	101.8	17.1	13.8	....	11.3
6	18	19.1	107.1	17.0	13.9	9.5	11.5
7	22	20.6	113.4	17.2	13.8	9.8	11.7
8	17	23.3	121.3	17.3	14.0	10.2	11.9
9	27	23.7	121.6	17.4	14.0	10.2	12.1
10	19	27.5	128.9	17.5	14.1	10.5	12.2
11	30	30.3	134.4	17.8	14.1	10.6	12.2
12	36	33.5	139.6	17.6	14.3	10.9	12.5
13	36	39.0	146.6	17.8	14.3	11.0	12.7
14	36	45.5	150.9	18.1	14.3	11.1	12.9
15	46	46.6	156.2	18.3	14.5	11.4	12.9
16	31	52.2	160.9	18.2	14.7	11.8	13.3
17	53	51.7	159.8	18.4	14.6	11.8	13.2

* At ages 6 to 14, the *N*'s for face height are a few less than for the other measurements: Mexico *N*'s are 17, 13, 19, 16, 29, 17, 28, 27, and 28; Texas *N*'s are 13, 19, 16, 24, 16, 27, 34, 35, and 35.

Coahuila) and partly in Texas (San Antonio, Austin, and Taft). The Texas sample consisted of "United-States-born" children whose parents or grandparents were "born in Mexico" (2, pp. 7, 13). For both samples, "economic status of the families . . . was generally low" (2, p. 13). Aside from evidences of poor living conditions, all subjects measured were judged to be physically nonpathologic, i.e., children with "no apparent illness or other unusual condition" (2, p. 37).

Means at successive annual ages for weight, stature, head length, head width, face height, and face width are presented in Tables 4 and 5. Weight was taken with "shoes, coat, sweater, or jacket removed" and an allowance made "for the clothing worn" (2, p. 37). Stature was measured "with the Martin Anthropometer . . . without shoes" (2, p. 36). The head and face distances were maximum glabello-occipital, biparietal, nasion-menton, and bizygomatic. Age was calculated to the nearest birthday.

Table 4 was derived with the data for each measurement separated by age and region, but not by sex. In obtaining Table 5 the classification procedure followed the same lines except that there was separation by sex, but not by region. (The paucity of subjects for a given age made it imprudent to tabulate by region and sex simultaneously.) Findings from Tables 4 and 5 are:

1. On the whole, the children studied in Mexico are smaller than those studied in Texas. Of the 84 comparable means for each region presented in Table 4, 64 are larger on the children residing in Texas, 13 are equal, and 7 are larger on the children residing in Mexico. In magnitude, considering all ages together, the Texas means are higher than the Mexico means by 1.0 kg. in weight, 2.2 cm. in stature, 0.2 cm. in head length and face width, and 0.1 cm. in head width. The least substantial findings from regional comparison are on face height; here the difference signs show poorest consistency and the average difference in means is less than 0.1 cm.

2. In general, sex differences in children of Mexican ancestry harmonize with those found for other North American groups (5, 8, 7), i.e., the average male is larger than the average female (*a*) over the entire period studied in head length, head width, face height, and face width, and (*b*) over the periods from 3 to 10 years and 15 to 17 years in weight and stature. The weight means of Table 5 show males to surpass females by an average of 1.2 kg. for the age interval 3 to 10 years, females to surpass males by 3.8 kg. at 13 years, and males to surpass females by 2.7 kg. at 15 years and 6.1 kg. at 17 years. Corresponding differences in stature are 2.1 cm., 3.0 cm., 7.9 cm., and 9.7 cm. For the head and face dimensions, males are found to exceed females—all ages combined—by 0.6 cm. in head length and 0.3 cm. in head width, face height, and face width.

Means at consecutive annual ages from 5 years to 17 years were reported by Priani (20) for weight, stature, stem length ("o Talla, sentado"), arm span, chest girth ("medio"), and shoulder width. These means are reproduced in Table 6. The subjects were 100 Mexican school children of each

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TABLE 5

MEANS FOR SIX MEASUREMENTS OF BODY SIZE ON MALES AND FEMALES
OF MEXICAN ANCESTRY. DATA COLLECTED 1941-42
IN MEXICO AND TEXAS

<i>Age (yrs.)</i>	<i>N</i>	<i>Weight (kg.)</i>	<i>Stature (cm.)</i>	<i>Head Length (cm.)</i>	<i>Head Width (cm.)</i>	<i>Face Height*</i> (cm.)	<i>Face Width (cm.)</i>
M A L E S							
3	11	14.2	87.3	.....	.....	.....	.....
4	14	16.4	97.3	17.1	13.7	.....	11.1
5	14	17.8	102.3	17.3	13.8	.....	11.2
6	23	19.2	107.9	17.2	13.9	9.6	11.5
7	18	21.1	115.7	17.2	14.0	9.9	11.7
8	19	22.9	117.8	17.5	14.1	10.1	11.8
9	27	25.1	124.5	17.5	14.1	10.3	12.1
10	26	29.1	128.5	17.7	14.3	10.6	12.2
11	24	29.9	133.7	17.9	14.2	10.6	12.3
12	33	33.8	139.6	17.8	14.4	10.9	12.6
13	36	36.2	143.1	18.1	14.4	11.0	12.6
14	29	40.4	150.9	18.2	14.5	11.1	12.8
15	28	48.1	159.6	18.6	14.6	11.8	13.1
16	33	52.1	163.5	18.6	14.8	12.0	13.4
17	38	55.0	164.7	18.8	14.8	12.1	13.5
F E M A L E S							
3	8	13.5	87.0	.....	.....	.....	.....
4	9	14.9	94.7	16.2	13.2	.....	10.7
5	17	16.9	100.2	16.7	13.6	.....	11.4
6	15	18.7	105.9	16.7	13.9	9.3	11.3
7	21	20.0	111.4	16.9	13.6	9.7	11.4
8	22	22.1	117.7	16.8	13.7	9.9	11.6
9	19	24.0	120.0	17.0	13.8	10.0	11.8
10	23	26.4	127.9	17.2	13.7	10.3	11.8
11	25	29.9	133.8	17.4	14.0	10.5	12.1
12	32	34.0	139.0	17.5	14.1	10.7	12.3
13	28	40.0	146.1	17.6	14.1	11.1	12.5
14	37	45.9	150.0	17.8	14.2	11.2	12.8
15	43	45.4	151.7	17.9	14.3	11.2	12.8
16	34	47.0	153.5	17.8	14.4	11.3	12.9
17	48	48.9	155.0	18.0	14.4	11.4	12.8

* At ages 6 to 14, the *N*'s for face height are less than for the other measurements: the male *N*'s are 16, 15, 17, 24, 23, 22, 31, 35, and 28; the female *N*'s 14, 17, 18, 16, 22, 22, 31, 27, and 35.

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age and sex drawn from the middle socioeconomic groups, i.e., "100 de cada edad y sexo . . . exclusivamente niños de la clase media" (20, p. 353). Collection of the data took place over the years 1925-29 at urban schools in Mexico. The shoulder width was bicromial diameter; the chest plane, al-

TABLE 6
MEANS FOR SIX MEASUREMENTS OF BODY SIZE ON CHILDREN OF
MEXICAN DESCENT RESIDING IN MEXICO. DATA
COLLECTED 1925-29 ON 100 SUBJECTS
OF EACH AGE AND SEX

Age (yrs.)	Weight (kg.)	Stature (cm.)	Stem Length* (cm.)	Arm Span (cm.)	Chest Girth† (cm.)	Shoulder Width‡ (cm.)
		M	A	L	E	S
5	17.5	106.5		59.5	106.0	53.0
6	19.0	111.0		61.0	111.0	54.5
7	21.0	115.5		63.5	116.0	57.0
8	23.0	121.5		65.8	122.0	59.0
9	25.5	126.5		67.0	127.0	60.0
10	28.0	131.5		69.5	132.0	63.0
11	31.0	136.0		71.5	137.5	65.5
12	33.5	140.5		73.0	142.5	67.0
13	38.0	147.0		76.0	149.5	70.0
14	43.0	154.0		80.0	156.5	73.0
15	48.5	160.5		83.5	163.0	77.0
16	51.0	163.5		85.0	166.5	78.5
17	53.5	164.5		86.5	168.5	80.0
		F	E	M	A	L
5	17.5	106.5		58.5	105.0	52.0
6	19.0	111.5		60.5	115.0	54.0
7	21.0	116.5		63.0	115.0	55.5
8	24.0	122.5		65.5	122.0	57.5
9	25.5	126.0		67.5	126.0	58.5
10	28.5	132.0		70.0	132.0	60.0
11	31.5	136.5		70.0	137.5	62.0
12	36.0	142.5		76.0	142.0	65.0
13	44.5	149.5		78.0	150.0	67.0
14	48.0	151.0		80.0	153.0	69.0
15	50.0	153.0		81.0	154.5	70.0
16	51.0	154.0		81.5	155.0	71.0
17	51.0	153.5		82.0	155.0	71.0

* Sitting height.

† At mid-respiration.

‡ Bicromial diameter.

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though not specified, probably approximated level of the nipples; in the weight records "allowance was made for the amount of clothing worn" (24, p. 48); and age was taken to the nearest birthday.

Weight and stature means covering the same age period as the Priani means were published by Lloyd-Jones (5). These are shown in Table 7.

TABLE 7
MEANS FOR BODY WEIGHT AND STATURE ON CHILDREN OF MEXICAN
ANCESTRY RESIDING IN CALIFORNIA. DATA COLLECTED
IN LOS ANGELES SCHOOLS 1936-38

Age (yrs.)	M A L E S			F E M A L E S		
	N	Weight* (kg.)	Stature (cm.)	N	Weight* (kg.)	Stature (cm.)
5	359	18.9	109.0	344	18.0	107.3
6	949	20.4	112.9	928	19.6	112.0
7	1088	22.5	118.5	1092	21.7	117.5
8	1173	25.0	124.0	1080	24.4	123.4
9	1202	27.5	129.0	1048	27.0	128.5
10	1117	30.2	133.6	1136	29.9	133.8
11	1198	33.3	138.8	1112	33.9	139.6
12	1093	37.1	144.3	984	39.0	145.8
13	890	41.6	150.1	900	43.3	150.7
14	774	47.0	156.5	722	47.4	154.2
15	619	52.1	162.2	688	49.2	155.4
16	519	55.8	165.8	555	50.4	156.4
17	253	57.5	167.1	296	50.9	156.0

* In indoor clothing at younger ages and in gymnasium clothing at older ages.

The data were gathered through a city-wide survey of Mexican school children made 1936-38 at Los Angeles, California. "In elementary schools shoes, coats and heavy sweaters were removed from the children before weighing. In junior and senior high schools only gymnasium trunks and blouses were worn . . . All heights were taken with the children in stocking feet . . . age was counted to the nearest birthday" (5, p. 11).

Compared with the means from Table 6 on Mexican children living in Mexico, the means from Table 7 on Mexican children living in California are higher for stature in both sexes and higher for weight in males. The stature differences average 2.6 cm. on males and 2.0 cm. on females.⁵ The weight differences on males average 1.6 kg. for ages 5 to 8 years, 2.5 kg. for ages 9 to 12 years, and 4.0 kg. for ages 13 to 17 years. On females, the only

⁵ Since the Mexico data were collected a decade earlier than the California data, part of the discrepancy may represent secular change (9, 17).

appreciable weight differences occur at ages 9 to 12 years—during the early elementary school years the California means do not surpass the Mexico means by more than could be accounted for as the clothing differences, while in the post-menarcheal years the Mexico means are higher than the California means by about 0.5 kg.

Besides studying Los Angeles Mexican children, Lloyd-Jones studied Los Angeles white, Negro, and Japanese children. The Mexican children were found to be heavier and taller than the Japanese children, but lighter and shorter than the Negro and white children. At the three ages 5, 11, and 17 years,

1. The schoolboys of Japanese lineage were shorter by 1.7 cm., 2.7 cm., and 2.5 cm.; and lighter by 0.5 kg., 1.1 kg., and 1.1 kg. Corresponding differences between the Mexican and Japanese schoolgirls were 1.1 cm., 1.9 cm., and 2.0 cm. for stature; 0.4 kg., 1.4 kg., and 1.6 kg. for weight.

2. The American Negro schoolboys were taller by 2.5 cm., 3.0 cm., and 4.5 cm.; and heavier by 0.5 kg., 1.2 kg., and 4.4 kg. Parallel differences between the Mexican and Negro schoolgirls were 3.1 cm., 3.1 cm., and 4.6 cm. for stature; 0.8 kg., 1.1 kg., and 2.9 kg. for weight.

3. The schoolboys of European ancestry were taller by 3.2 cm., 4.2 cm., and 5.9 cm.; and heavier by 1.1 kg., 2.7 kg., and 5.1 kg. Analogous differences between the Mexican and white schoolgirls were 3.9 cm., 4.2 cm., and 6.0 cm. for stature; 1.3 kg., 2.5 kg., and 3.2 kg. for weight.

Manuel (6) and Whitacre (24) each studied several items of body size on children of Mexican descent enrolled in Texas public elementary schools. Manuel's data were gathered during the spring of 1930 at schools in Laredo and El Paso, Whitacre's between 1929 and 1931 at a "representative . . . Mexican school" in San Antonio. Both investigators report means at yearly intervals, the former from ages 6.5 to 15.5 years and the latter from ages 8 to 15 years.

Manuel measured weight, stature, shoulder width, hip width, chest depth, and arm girth. Weight was determined "without the removal of clothes other than coats, sweaters, and shoes" (6, p. 238). Stature was taken in the beginning by use of "a stadiometer connected with the weighing scales . . . but after a little while a rigid scale attached to a vertical screen or to a wall was substituted" (6, p. 238). The measurements of shoulders and hips were bideltoid and bitrochanteric diameters, each obtained with "wooden sliding calipers" and adjusted for "thickness of the clothing" (6, p. 238). Spreading calipers were used in taking chest depth: "One end of the calipers was placed over the sternum just below the depression between the ends of the two clavicles, and the other end was placed over the spiny process of the vertebra about the same level" (6, p. 238). Arm girth was obtained with tapes designed to afford spring-controlled tension. It is not clear, however, whether the measures analyzed represent (a) "arm hanging loosely at the side," (b) "arm at right angles with the body and forearm

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flexed back so that the fingers touched the shoulders," or (c) the average of these two positions (6, p. 239).

Whitacre's subjects were "all citizens of the United States" (24, p. 5). Some were measured once only and some as many as "five times . . . at intervals of 5 to 9 months" (24, p. 6). In no instance, however, were records on a subject tabulated twice in one annual age grouping. The items measured were weight, stature, stem length, shoulder width, and hip width. Weight was taken nude, after urination; stature against an upright board;

TABLE 8
MEANS FOR SIX MEASUREMENTS OF BODY SIZE ON CHILDREN OF
MEXICAN DESCENT LIVING IN LAREDO AND EL PASO,
TEXAS. DATA COLLECTED IN 1930

Age (yrs.)	N	Weight* (kg.)	Stature (cm.)	Shoulder Width† (cm.)	Hip Width† (cm.)	Chest Depth‡ (cm.)	Arm Girth§ (cm.)
M A L E S							
6.5	106	20.5	114.0	25.4	20.1	9.1	16.7
7.5	149	22.2	118.6	26.6	20.8	9.5	16.9
8.5	217	24.4	123.4	27.4	21.6	9.8	17.5
9.5	218	27.2	129.0	28.6	22.7	10.2	18.3
10.5	273	29.4	133.6	29.7	23.6	10.5	19.0
11.5	237	32.5	138.4	30.6	24.6	10.8	19.7
12.5	205	35.9	143.5	31.5	25.7	11.1	20.5
13.5	194	41.0	150.9	32.9	27.1	11.6	21.9
14.5	145	45.5	156.0	34.5	28.5	12.1	23.0
15.5	74	49.1	159.8	35.9	29.5	12.5	24.2
F E M A L E S							
6.5	108	19.5	113.3	24.8	20.0	9.0	16.4
7.5	143	21.6	118.4	26.2	21.0	9.5	17.0
8.5	184	23.5	123.2	27.1	21.8	9.7	17.4
9.5	240	26.3	128.5	28.1	22.8	10.0	18.2
10.5	241	28.8	133.6	29.3	23.8	10.3	18.8
11.5	206	32.6	139.7	30.5	25.2	10.7	19.7
12.5	223	38.0	145.8	31.9	27.2	11.3	20.9
13.5	177	40.5	150.9	32.9	28.5	11.6	21.3
14.5	136	44.7	152.7	33.9	29.8	12.0	23.5
15.5	98	45.9	153.7	34.2	30.3	12.1	23.0

* In indoor clothing. Samples showed weight of the clothing worn to increase with age, averaging 0.4 kg. to 0.8 kg. for males and 0.2 kg. to 0.4 kg. for females.

† Bideltoid width of shoulders and bitrochanteric width of hips.

‡ Upper sternum level.

§ Technique uncertain.

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TABLE 9

MEANS FOR FIVE MEASUREMENTS OF BODY SIZE ON CHILDREN OF
MEXICAN LINEAGE LIVING IN SAN ANTONIO, TEXAS.

DATA AMASSED 1929-31

Age (yrs.)	N	Weight (kg.)	Stature (cm.)	Stem Length (cm.)		N	Shoulder Width* (cm.)	Hip Width† (cm.)	
			M	A	L	E	S		
8	65	23.1	122.2	66.1		34	27.4	21.3	
9	128	25.8	127.2	67.3		53	28.7	22.3	
10	170	27.7	131.5	69.0		72	29.2	22.9	
11	234	30.0	135.7	70.5		85	30.0	24.2	
12	221	32.3	139.7	71.9		64	31.3	25.0	
13	152	35.5	144.7	74.1		60	32.2	25.7	
14	100	39.2	150.5	77.0		43	33.8	26.7	
15	56	44.0	155.3	80.3		25	35.4	28.4	
			F	E	M	A	L	E	S
8	47	23.7	121.9	65.0		21	27.3	21.8	
9	110	24.6	125.5	66.5		44	28.1	22.3	
10	220	27.5	130.1	68.5		84	29.2	23.4	
11	268	30.1	135.7	71.0		94	29.7	24.3	
12	246	34.1	141.3	73.7		89	31.3	26.2	
13	182	37.7	145.8	76.0		67	32.0	27.3	
14	78	40.3	149.0	78.4		30	33.2	28.4	
15	37	42.2	152.3	79.8		..	....	....

* Bideloid diameter.

† Bitrochanteric diameter.

stem length by the Dreyer-Hanson technique; shoulder width as bideloid diameter; and hip width as bitrochanteric diameter.

Table 8 reproduces the means from Manuel, and Table 9 those from Whitacre. While the tables are not directly comparable, it is possible to achieve approximate comparability by subjecting values in Table 8 to subtraction and linear interpolation—the subtractions correcting the weight means for clothing, and the interpolations giving means for each measurement at birthday ages rather than inter-birthday ages. These adjustments were made, and comparative findings obtained, for 10 and 14 years of age.

At age 10 years, the two Texas samples have almost identical means. For males these are 27.8 kg. and 27.7 kg. in weight, 131.3 cm. and 131.5 cm. in stature, 29.1 cm. and 29.2 cm. in bideloid shoulder width, 23.1 cm. and 22.9 cm. in bitrochanteric hip width.

At age 14 years, the San Antonio children are lighter, shorter, and narrower at the hip region than the Laredo and El Paso children. The respec-

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tive means differ by 3.0 kg., 3.0 cm., and 1.1 cm. for males; and by 1.9 kg., 2.8 cm., and 0.8 cm. for females. For width of shoulders the means from the two samples agree within 0.1 cm. for males and 0.2 cm. for females.

Intercomparison of all tables from 5 through 9 shows the means for stature to vary between 128.5 cm. and 133.6 cm. on 10-year-old males, 127.9 cm. and 133.8 cm. on 10-year-old females, 150.5 cm. and 156.5 cm. on 14-year-old males, 149.0 cm. and 154.2 cm. on 14-year-old females. The low means at 10 years are from Table 5, the low means at 14 years from Table 9, and the high means at both ages from Table 7. Additional intercomparisons are left to the reader.

Paschal and Sullivan (19) studied "all of the nine- and twelve-year-old Mexican boys and girls in the Tucson Public School system" during the school year 1924-25 (19, p. 4). Their data were measures of stature, head length, head width, and face width (bizygomatic diameter). They computed means by age and sex for each of the four dimensions and, in the case of stature only, means by age, sex, and country of birth.

Table 10 represents the results. The means for stature shown in the upper part of the table are lower by an average of 0.8 cm. than those in Table 8 on Laredo and El Paso children at corresponding ages. For head length, head width, and face width, the means are equivalent on the Paschal and

TABLE 10
MEANS (cm.) FOR FOUR BODY DIMENSIONS ON CHILDREN OF
MEXICAN DESCENT ENROLLED 1924-25 IN THE
PUBLIC SCHOOLS OF TUCSON, ARIZONA

Age (yrs.)	N	Stature				Head Length	Head Width	Face Width
		M	A	L	E	S		
9.5	103					128.6	17.6	14.3
12.5	101					142.8	18.1	14.2
Age (yrs.)	N	Stature				Head Length	Head Width	Face Width
		F	E	M	A	L	E	S
9.5	90					127.8	17.1	13.9
12.5	95					144.5	17.5	14.0
Age (yrs.)	BORN IN MEXICO				BORN IN U.S.A.*			
	Males		Females		Males		Females	
	N	Stature	N	Stature	N	Stature	N	Stature
9.5	26	127.0	17	125.3	69	128.9	58	128.4
12.5	33	142.6	29	145.2	65	142.9	60	144.9

* Approximately 80 per cent were born in Tucson, Arizona.

Sullivan sample drawn in Arizona and the Goldstein sample drawn in Mexico and Texas (Table 5).

"Of the Mexicans in the United States there are . . . the transient laboring element . . . and the more or less permanent" (19, pp. 54-55). Lawson (4) investigated eight measures of body size on schoolgirls of the latter group residing at or near Compton, California. She used samples at ages 12 (11.75 to 12.25 years) and 16 (15.75 to 16.25 years). The samples were drawn during the school year 1950-51 at two junior high schools—Paramount and Willowbrook in the Compton Union High School District. In order to exclude migratory workers, "it was required that every subject had been a resident of Southern California at least over the period since she was six years of age . . . the fathers of the majority of the girls were employed in industrial plants, dairy and meat-cutting concerns, and state or county road departments" (4, pp. 4-5).

The items studied were weight, stature, chest girth, hip width, and four girths of the extremities. Weight was determined "wearing anklets, undershorts, brassieres, shirts and gym shorts" (4, p. 7). Chest girth was taken, after each girl had "removed her gym shirt and loosened her brassiere," at the level of the xiphisternal junction during normal respiration. The hip width obtained was bi-iliacal diameter—sliding wooden calipers were employed and firm pressure applied. Girths of arm, forearm, thigh, and leg were taken on the left side, with the tape making sufficiently light contact to avoid compression of the tissues. In measurement of arm and forearm girth, the upper limbs hung at the sides of the body in a relaxed condition and maxima were determined "approximately halfway between the shoulder and the elbow" and "in the area of radiale" (4, p. 9). Thigh girth and leg girth were obtained with the feet 6 inches apart and the weight distributed equally through both lower limbs. The largest circumferences were sought "immediately below the gluteal fold" and "in the region of the calf" (4, p. 9).

Measures of central tendency and variability describing the data accumulated at both ages are presented in Table 11. Each row characterizes a specified distribution, while each column depicts the 16 distributions with reference to a particular statistic. The kinds of intrinsic content carried by the table, and the comparative purposes to which it can contribute, are similar to those enumerated in discussing Table 2. Comparative findings are:

1. In relation to other groups of females of Mexican descent, Lawson's means for weight and stature are (a) the highest reported at age 12 years and (b) unsurpassed by those of any other study at age 16 years. The means on children of the "middle classes" studied 1925-29 at urban schools in Mexico (Table 6) are smaller than these 1950-51 means for "permanent residents" of California by 13.9 kg. in weight and 10.7 cm. in stature at 12 years, and by 1.9 kg. in weight and 2.6 cm. in stature at 16 years. Incidentally, the finding of larger differences at 12 years than at 16 years har-

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TABLE II

STATISTICS (MEANS, FOUR PERCENTILES, AND EXTREME VALUES) ON FEMALES OF MEXICAN ANCESTRY HAVING LIVED IN CALIFORNIA FOR SIX YEARS OR MORE. DATA GATHERED 1950-51 BY LAWSON

Measurement	Mean	Minimum	P ₁₀	P ₅₀	P ₇₀	P ₉₀	Maximum
AGE 12 YEARS, N = 75							
Weight (kg.) ..	49.9	32.3	38.3	43.9	55.5	65.0	67.1
Stature (cm.) ..	153.2	140.0	145.4	151.5	156.7	159.3	163.0
Chest Girth* ..	71.5	63.0	64.5	66.5	73.6	81.7	86.0
Hip Width† ...	26.1	22.0	24.1	25.3	26.6	28.4	30.0
Arm Girth	23.5	18.0	20.2	21.9	24.8	27.4	29.0
Forearm Girth .	22.0	17.4	19.6	20.9	22.6	24.6	26.6
Thigh Girth ...	49.6	37.0	43.1	45.6	52.5	56.6	60.0
Leg Girth	31.4	25.5	27.7	29.6	33.2	35.6	37.5
AGE 16 YEARS, N = 79							
Weight (kg.) ..	52.9	39.9	43.2	47.8	54.3	63.7	94.3
Stature (cm.) ..	156.6	139.0	149.9	153.8	160.2	162.8	167.0
Chest Girth* ..	72.1	62.0	65.9	68.4	73.6	77.7	97.0
Hip Width† ...	27.6	23.4	25.6	26.6	28.2	30.2	34.2
Arm Girth	24.0	19.5	20.9	22.3	24.5	27.6	32.0
Forearm Girth .	21.8	18.6	20.1	20.8	22.5	24.0	25.4
Thigh Girth ...	49.8	40.0	43.8	46.9	51.4	56.3	69.0
Leg Girth	32.0	27.0	28.7	30.6	33.2	35.0	43.0

* Xiphisternal level, mid-respiration.

† Bi-iliocrystal diameter.

monizes with our knowledge of greater change in human size during recent decades at the childhood and early adolescent ages than in late adolescence and adulthood (9, 17, 18).

2. In relation to corresponding means on females of European ancestry measured at the same time and place, and by the same anthropometrist,⁶ two-thirds of the Table 11 means are lower and most of the remaining third approximately alike. At ages 12 and 16 years respectively, the non-Mexican girls are taller in stature by 3.5 cm. and 4.9 cm., larger in thigh girth by 1.3 cm. and 3.5 cm., larger in leg girth by 0.9 cm. and 2.0 cm., and larger in arm girth by 0.4 cm. and 1.5 cm. Weight is greater on the Mexican sample by 1.5 kg. at age 12 and greater on the white sample by 2.4 kg. at age 16: forearm girth is the same for both groups at age 12 and larger on the white sample by 1.1 cm. at age 16. The two groups are similar in hip width and chest girth.

⁶Data collected 1950-51 at Compton, California, on 112 white females aged 12 years and 105 aged 16 years.

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TABLE 12
COMPOSITE MEANS FOR WEIGHT AND STATURE ON CHILDREN OF
MEXICAN ANCESTRY STUDIED IN MEXICO, TEXAS AND CALI-
FORNIA DURING THE QUARTER CENTURY FOLLOWING 1925

Age (yrs.)	M A L E S			F E M A L E S		
	N*	Weight (kg.)	Stature (cm.)	N*	Weight (kg.)	Stature (cm.)
Birth	99	3.2	50.3	111	3.1	49.8
0.5	123	6.8†	65.1	118	6.5†	64.4
1	77	8.1	70.6	78	7.8	70.3
2	24	10.9	82.0	21	10.1	81.6
4	14	16.4	97.3	9	14.9	94.7
6	1072	19.9	112.6	1043	19.4	111.9
8	1540	24.1	123.3	1412	23.8	122.9
10	1658	29.0	132.8	1719	28.9	132.7
12	1668	35.2	142.9	1651	37.7	144.7
14	1172	45.0	155.2	1093	46.0	153.1
16	652	54.7	165.3	768	50.4	156.0

* The N's listed are for weight. Those for stature are the same except at birth, 6 months, 1 year, and 2 years; at these ages the male N's are 93, 42, 39 and 8, and the female N's 88, 40, 19 and 10.

† The means from the Departamento de Asistencia Infantil de México (which could not be utilized in deriving this table because N's were not known) are higher at 6 months, 1 year, and 2 years by 0.4 kg., 1.2 kg. and 0.6 kg. for males and by 0.5 kg., 1.3 kg. and 1.4 kg. for females (see Table 3).

COMPOSITE MEANS FOR WEIGHT AND STATURE

More study has been made of weight and stature than of other measures of body size. Every investigation described includes data for stature, while weight is lacking in a single instance only (see Table 10).

Table 12 presents composite means for both measurements at selected ages between birth and 16 years. A clear understanding of the make-up and limitations of this table is important. Briefly, the table constitutes a synthesis of the presently available weight and stature data for the ages indicated. The subjects are children of Mexican descent and the synthesis is for central tendency by sex and measurement. Unfortunately, all of the values in the table are not similar from the standpoints of population sampled (e.g., the samples at 1, 2, and 4 years typify lower socioeconomic strata than those at older ages⁷) and statistical dependability (e.g., the N's at 4 years are less than 20, those at 10 and 12 years over 1,600).

The means at each age from birth to 4 years are based upon data accumulated by Goldstein in Mexico and Texas. Data from Goldstein, Priani,

⁷ In this connection, see reference 15.

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and Lloyd-Jones are combined at age 6 years. For males the same three studies are pooled at age 16, and the same three plus those of Manuel and Whitacre at ages 8, 10, 12, and 14. The only difference for females is the addition of Lawson's data at ages 12 and 16. In the case of Whitacre's study, birthday values were obtained by interpolation. The composite weight means are for weight nude, clothing adjustments having been made wherever necessary.

For the age period 6 to 16 years, the composite means are weighted heavily with the data from Lloyd Jones (Table 7). This follows since the number of subjects in this study is more than double that for all of the other studies combined. At age 10 on males, for example, the composite weight mean⁸ is 29.0 kg., and the average of the five component means (without regard to their respective *N*'s) is 28.4 kg. Similarly, the composite male mean for stature at age 10 is 132.8 cm. and the average of the five component means 131.3 cm. On males 6 and 14 years of age the unweighted averages are less than the weighted averages of Table 12 by 0.5 kg. and 2.6 kg. for weight, 2.0 cm. and 2.1 cm. for stature. Corresponding differences for females at 6, 10, and 14 years of age are 0.4 kg., 1.1 kg., and 1.3 kg. in weight; 2.1 cm., 1.8 cm., and 1.9 cm. in stature.

SUMMARY AND CONCLUSIONS

Original findings are reported and the findings of other investigators reviewed. The problem is that of augmenting and ordering scientific knowledge on a particular morphologic topic: The body size of North American children of Mexican lineage.

Materials are assembled for the age period extending from birth to 17 years. The subjects were measured within the temporal span delimited by 1924 and 1951, and within the geographic zone encompassing central and northern Mexico, Texas, Arizona, and southern California. Several previously unpublished analyses of data are tabled (Tables 2, 3, 4, 5, 11); results are reproduced from six widely scattered earlier publications (2, 5, 6, 19, 20, 24); and emphasis is placed on intercomparison and integration of findings from different studies.

Statistics for body weight and stature are presented at all ages from birth through adolescence, although the number of records between 2 and 4 years of age is meager. Chest girth is studied over the first postnatal year and between the ages of 5 and 17 years. There are analyses for head length, head width, and face width at ages 4 to 17 years; for stem length, arm span, and shoulder width at ages 5 to 17 years; for face height at ages 6 to 17 years; for hip width, chest depth, and arm girth at ages 6.5 to 15.5

⁸ A precise statement of the method for obtaining composite means will be found in reference 10, p. 12.

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years; and (females only) for forearm girth, thigh girth, and leg girth at 12 and 16 years of age.⁹

Present knowledge on the body size of children of Mexican ancestry is shown to be fairly adequate in certain respects and to fall far short in other respects. Its area of strength pertains largely to central tendency statistics covering the late childhood and adolescent years. For several dimensions, sufficiently reliable sample means are reported at ages from 5 to 17 years (a) to yield useful estimates of population means, (b) to indicate the general form of central tendency curves, and (c) to show the direction of sex differences in various age periods. There are also systematic differences in means associated with geographic region, socioeconomic level, and secular period.

Areas in which research information is inadequate or lacking include the following: (a) all problems of body size in the age period 1 to 4 years, (b) dispersion of measurements of body size at most ages, and (c) individual variations in growth pattern and growth rate for all dimensions.¹⁰

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⁹ These items of body size constitute a fairly short series when viewed in relation to such comprehensive series as the 70 items studied by Scammon and Calkins (21).

¹⁰ For amplification of problems of individual growth in body size, see reference 16 and reference 8, pp. 319-343.

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A PRELIMINARY STUDY OF DEVELOPMENTAL TRENDS IN SOCIEMPATHY: ACCURACY OF PERCEPTION OF OWN AND OTHERS' SOCIOMETRIC STATUS¹

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THE PROBLEM

Sociempathy is a form of social perception which refers to an individual's awareness of his own and others' sociometric status in a given group of which he is a member. Among other properties this content of awareness may be more or less accurate, i.e., may correspond more or less to the actual situation with respect to sociometric status depending on sociempathic ability. Hence from an operational standpoint, a person may be said to have good sociempathic ability if he can accurately predict the relative degree of acceptance or rejection accorded the component members of the group (including himself) by the other group members.

In general, the few available studies we have in the area of sociempathy have dealt with the sociempathic ability of teachers (i.e., their ability to predict the sociometric status of their pupils), and have ignored the pupils' awareness of their own status and that of their classmates. As a result, at least two large gaps remain in our knowledge of the development of social perception in children: What does the growth curve for sociempathic ability look like? What are some of the determinants and consequences of individual differences in sociempathic ability? The present study represents an exploratory attempt at devising a method for measuring various developmental aspects of sociempathy, i.e., growth curves, changes with age in the distribution of ratings and predictions of status, and teachers' sociempathic ability.

SOCIEMPATHY IN RELATION TO EGO AND SOCIAL DEVELOPMENT

Despite the absence of empirical data in the area of sociempathy, its theoretical implications for ego and social development have not been ignored.

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Students of animal and child behavior have implicitly accepted the existence of sociempathic ability as a basic prerequisite for interpersonal relations and group structure, an ability that emerges relatively early in the phylogenetic scale and in the course of ontogenesis. It is a commonplace observation that even a young puppy can grasp the relative status positions of various members of a human household and guide himself accordingly in his dealings with them. Perception of hierarchical status is also necessary for the emergence of the "pecking order" which constitutes the basic social framework in which the group behavior of fish, birds, fowl, dogs, etc., takes place.

That infants are able from an early age to perceive gross patterns of acceptance and rejection in relation to parents and siblings is an ecological datum on which there is unanimity of agreement among many competent observers (27, 30, 32, 34, 38, 40). Such perceptions underlie the type of interpersonal relationships they establish with parents and siblings. It has been postulated, for example, that the infant's feelings of "omnipotence" is simply an outgrowth of his perception of the permissive handling he receives from parents out of deference for his biosocial helplessness (4). That such feelings realistically reflect a prevailing social situation is demonstrated by the fact that he does not anticipate receiving the same degree of subservience from older siblings as he does from parents. What he probably fails to appreciate, however, (because of sociempathic immaturity) is the *reason* for parental deference to his needs and wishes, mistaking their altruism for obligatory submission to his unopposable will (4). Hence, the view expressed in many quarters (30, 32, 34, 40) that the infant is sensitive to all possible subtleties and shadings of parental attitudes does not seem very credible if we are to accept the concept that the growth of sociempathic ability is a product of cumulative social experience.

What little ecological evidence we have regarding the organization of children's groups also lends inferential support to the belief that sociempathic ability is a developmental function which is quite primitive at first with respect to the size and complexity of the social group in which it can efficiently operate (15, 24, 33). This evidence indicates that children under the age of eight or nine are quite incapable of effective group activity implicating a sizeable number of individuals which is spontaneously organized, highly structured, and free of adult supervision (11, 24, 41). It would not be an unreasonable hypothesis, therefore, to relate the absence of complex group structure prior to this age level to sociempathic immaturity, especially if it could be shown that the emergence of these new social capacities coincides with a marked spurt in sociometric awareness.

Interpersonal relations and group structure become possible when individuals are able to perceive the attitudes of others toward themselves and feel confident enough of their perceptions to hazard both predictions regarding the nature of these attitudes, and adaptive responses based on such predictions. As Bender and Hastorf put it, "In everyday situations we de-

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pend necessarily on our capacity to perceive and predict the behavior, thoughts and feelings of the other person. . . . Our socialization is reared on this foundation of perception of persons in terms of prediction" (5).

The adjustment of an individual to his peer group, therefore, is partly a function of how well he is able to perceive the relative hierarchical status of the various group members, including his own. Insofar as these perceptions are accurate, a more realistic basis for interpersonal relations is provided; for his aspirations with respect to assuming various roles in group activities, his expectations of the roles others might be induced to play, the demands he might legitimately make on others (in terms of their disposition to respond favorably to same), the attitudes he might adopt in dealing with them, etc., are more or less appropriate and realistic in accordance with the validity of his estimates of his own and others' sociometric status.

PREVIOUS STUDIES RELATED TO SOCIEMPATHY

The operations necessary for measuring sociempathic ability have, of course, been suggested by many previous studies of empathy. Essentially all of these studies employed the method of relating an individual's predictions of the content of another person's attitudes or feelings to their actual content as reported by the other person. Dymond (13, 14), for example, measured empathic ability by first requiring *A* to predict how *B* would rate him (*A*) and how *B* would rate himself (*B*). She used the discrepancy between these two predictions and the *actual* ratings involved (*B*'s actual ratings of *A* and *B* respectively) as a measure of empathic ability. Gage (18) asked his subjects to forecast the responses of another person on the Kuder Preference Record on the basis of observing some of the latter's expressive behavior. The number of correct predictions was taken as a measure of the accuracy of social perception. Bender and Hastorf (5) used a similar method in having their subjects forecast the responses of other persons on three personality scales. However, their measure of empathic ability was much more gross, consisting of a product-moment correlation between the actual *total* scores of the latter and the *total* scores forecasted by the former on each of the three scales.

Of these studies, Dymond's (13, 14) comes closest to the measurement of sociempathic ability since her subjects were not forecasting the *general* attitudes and interests of others but the trait evaluations which the latter persons made specifically in relation to them. Although such predictions necessarily depend on personal interaction between the two individuals concerned, they do not involve a perception of the degree of acceptance-rejection characterizing the feelings of another toward his confreres. Several studies of teachers' sociempathic ability have been undertaken (7, 9, 20, 29), but these suffer from the obvious disadvantages that the teachers' predictions of others' status are made from the standpoint of a non-peer group member,

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and that no corresponding predictions of own status could be made. Singer (37) has recently reported a study in which each of twelve graduate students in psychology ranked the others in order of personal preference and also made predictions of how the others would order their preferences. The agreement between actual and predicted order of preference in each case constituted a measure of sociopathic ability.

METHOD

Population. The population consisted of elementary and junior high-school pupils from three public schools in Bloomington, Illinois, and of high-school students from University High School in Urbana, Illinois. Two classes each of third-, fifth-, and seventh-grade pupils were represented in the Bloomington population; and the entire junior and senior classes of University High School were used. The Bloomington schools are situated in middle-class, residential neighborhoods. The parents of the University High School group are for the most part professional persons, a large percentage holding academic appointments in the University of Illinois. Entrance into the school, however, is unrestricted except for the payment of a small, nominal tuition fee.

Procedure. One of the investigators administered the procedures to all of the classes with the assistance of the class teachers involved. After a four-page booklet was distributed, the investigator stated:

I would like to know how well you are able to tell how your classmates feel about you. When you have to do things together with people, it's nice to know how they feel about you, because then you know better how to act with them. No one besides myself will ever see the answers you write down, so don't be afraid to write what you really think.

On page one, I want you to write the names of the three pupils in the class who you feel are your best friends. Write the name of your best friend first. (Wait until pupils finish this task.)

On page two, there is a list of all the pupils in your class. Next to each pupil's name you are to place a number from one to five. "One" means you do not want this pupil to be your friend at all. "Two" means that you would not like to have this pupil as a friend. "Three" means that you do not care whether or not this pupil is your friend. "Four" means that you would like to have this pupil as your friend. "Five" means that you would like to have this pupil as one of your best friends. (This material is written on the blackboard. Wait until pupils finish this task.)

On page three there is a list of all the pupils in the class. Place a number from one to five next to each one to show how you think he or she feels about you. "One" means that you think, "This pupil does not want me as a friend at all." "Two" means that you think, "This pupil would not like to have me as a friend." "Three" means that you think, "This pupil does not care whether or not I am his friend." "Four" means that you

think, "This pupil would like to have me as a friend." "Five" means that you think, "This pupil would like to have me as one of his best friends." (This material is written on the blackboard. Wait until pupils finish.)

Page four also has a list of all the pupils in the class. On this page I want to see how well you can tell how popular each pupil in the class is, that is, how many pupils in the class want to be friends with him. Next to each pupil's name you are to place a number from one to five. "Five" means that you think this pupil is one of the most popular persons in the class, that he is one of the pupils with the largest number of friends. "One" means that you think this pupil is one of the least popular pupils in the class, that he is one of the pupils with the fewest friends. "Three" means that you think this pupil is just about in the middle of the class in the number of friends he has. "Two" means that you think this pupil is between "one" and "three," that is, you think he has more friends than the pupil to whom you give "one" but fewer friends than the pupil to whom you give "three." "Four" means that you think this pupil is between "three" and "five," that is, you think he has more friends than the pupil in the middle but less friends than the pupils you chose as "five." (This material is written on the blackboard.)

The same procedures were used for all groups, but in the high-school population the directions were phrased in a manner more appropriate for the age and intellectual status of the pupils. Also, since the younger children tended to experience some difficulty in discriminating between certain of the categories on the five-point scale, the investigator took pains to clarify the differences involved by providing further explanation and illustration.

The teachers of the third-, fifth-, and seventh-grade classes were also asked to predict the rank order equivalent of each pupil's sociometric status (the mean of the 1-5 ratings given him by his classmates on page two).

Note on IBM procedures. The data from the booklets was transferred to IBM cards for statistical analysis as follows: Three cards were prepared for each individual. On the first card we placed the sociometric ratings (page two) which the individual gave to his peers, each of whom was represented by a column number. The same procedure was followed in transferring the data from pages three and four onto cards two and three respectively. The average sociometric rank of any individual could thus be obtained by summing the punches in the column representing him on the first card and dividing by the total number of cards. By following the same procedure on the third card, we could obtain the group's mean prediction of an individual's status. However, to obtain the individual's mean prediction of his own sociometric status (as represented by the sum of the punches across his second card) it was necessary to create a transpose of the card so that these punches appeared in the same column through the deck of cards. The three best friends of an individual were indicated by signifying punches placed on his three cards in the appropriate columns corresponding to their names.

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RESULTS AND INTERPRETATION

Age trends in sociempathic ability. In deciding on an adequate measure of expressing accuracy of sociempathy that would validly reflect age differences in ability, we were immediately confronted by the fact that young children (more so than older children) have a tendency to use mostly the upper range of both the rating and prediction scales (Table 5). Under such conditions the correspondence between individual ratings and individual predictions would tend to be spuriously high in the younger age groups if degree of correspondence for a given age group were expressed as a mean of *individual* deviation scores; and correlational scores for the younger children obtained by correlating *individual* predictions against *individual* ratings would have questionable validity because of the marked degree of negative skewness characterizing the distribution of both variables (22, 25).

Since at this point we were only interested in comparing different age groups with respect to sociempathic ability, we decided to correlate *mean* predictions against *mean* ratings. For example, to determine accuracy of perception of own status in a given group, the mean of each individual's separate predictions of how other persons would accept him (page three) was obtained as well as his sociometric status (the mean of the actual sociometric ratings he received from the class). The resulting product-moment correlation between these two sets of scores was used as a measure of sociempathic ability with respect to own status. To determine accuracy of perception of others' sociometric status in a given group, scores representing the group's mean prediction of each individual's sociometric status were obtained and correlated against actual sociometric status scores.

Since the means of a series of non-normal distributions tend to be normally distributed (22), it was therefore possible to normalize the distribution of variables by using mean rather than individual ratings and predictions; and hence, scores represented by product-moment correlations could be made comparable over a wide age range.

The coefficients of correlation indicative of sociempathic ability for each of the two classrooms at the third-, fifth-, and seventh-grade levels respectively were combined by the method of geometric averaging, thus giving a single correlational score for each grade. This was considered justifiable since significant differences between the variances of the data (ratings and predictions) from the two classroom populations were found in no case when *F* tests were applied.

Changes with age in ability to perceive own and others' sociometric status are shown in Table 1 and Figure 1. From the probable errors of the correlational scores reported in Table 1, we know that these scores represent an ability to perceive own and others' sociometric status which for all grades is significantly greater than chance beyond the one per cent level.

The growth curves in Figure 1 show some indication of a trend toward increased sociempathic ability with age, but significant differences between

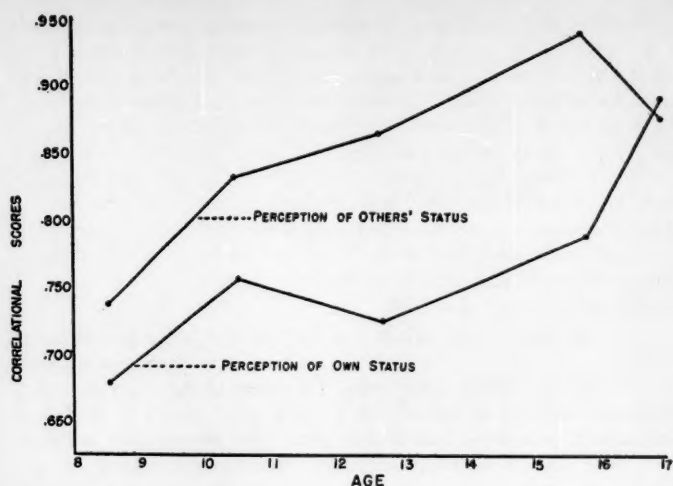


FIG. 1

FIGURE 1—Perception of own and others' sociometric status for various age levels.

TABLE I

PERCEPTION OF OWN AND OTHERS' SOCIOMETRIC STATUS BY AGE LEVELS

Age	Grade	N	Perception of Own Status		Perception of Others' Status	
			Correlational Score	D/PE _D	Correlational Score	D/PE _D
8.5	3	47	.678 ± .05		.736 ± .04	
10.5	5	41	.757 ± .04	1.15	.834 ± .03	1.80
12.7	7	56	.725 ± .04	0.5	.865 ± .02	0.8
15.8	11	45	.788 ± .04	1.15	.941 ± .01	3.10
17.0	12	56	.893 ± .02	2.6	.877 ± .02	1.0

successive grade levels are approached in only three cases. The period of greatest gain in the perception of own status occurs between the eleventh and twelfth grades. For perception of others' status, the greatest gain is registered between the seventh and eleventh grades with a somewhat smaller gain occurring between the third and fifth grades.

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The belief that significant differences are operating between grade levels is strengthened by an analysis of covariance between sociometric status scores and prediction of own status, and between the former scores and prediction of others' status. This shows that there is a statistically significant difference (at the one per cent level) between the regressions of the different age groups; that is, the five class regression functions are heterogeneous or not linearly related. In order to determine whether this significant difference could in part be accounted for by increasing age, an analysis of covariance was run separately between age and each of the three primary scores, i.e., sociometric status, prediction of own status, and prediction of others' status. This demonstrated that in all three cases age was operating as a significant variable at the five per cent level.

The comparability of the various groups represented on the growth curves is also open to question since the different grade levels were not matched for either sex or socio-economic status. The nature of the ability under investigation obviously demanded that existing stable groups be used; and since a large enough selection of such groups was not available to choose from, these factors could not be controlled experimentally. Analysis of variance between grade levels of each of the three primary scores showed significant differences operating at the five per cent level, indicating that the groups were not drawn from the same population. Hence an indeterminate amount of the variation between groups must be ascribed to sampling error. However, the varying socio-economic backgrounds of our groups cannot account for all the difference between groups in sociopathic ability, since our analysis of covariance has demonstrated that age is a significant factor in producing some of the inter-group variation in this function. Analysis of covariance also shows that, although there are significant differences operating between groups, there is nevertheless sufficient similarity between groups (i.e., in those relationships between the primary scores indicative of sociopathic ability) to suggest that the same types of factors are operant at all age levels. It can be concluded therefore that the groups are comparable with respect to the ability function if not with respect to the primary scores themselves.

Perception of others' sociometric status (except for the seventeen-year-old group) is consistently superior to perception of own sociometric status. It should be remembered, however, that the correlational scores for the former type of perception are based on means of group predictions, whereas the corresponding scores in the latter case are based on means of individual predictions.

Sociopathic ability for like and opposite sex groups. By separately relating the mean predictions which each sex made of the mean sociometric ratings of its like and opposite sex group, it was possible to abstract four different sex-related components for each type of sociopathic ability (Tables 2 and 3). Because this procedure reduced the number of subjects

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TABLE 2

SEX DIFFERENCES IN PERCEPTION OF OWN SOCIOMETRIC
STATUS BY AGE LEVELS

Age	Grade	Girls' Perception of Girls' Ratings		Girls' Perception of Boys' Ratings		Boys' Perception of Boys' Ratings		Boys' Perception of Girls' Ratings	
		N	r	N	r	N	r	N	r
8.5	3	29	.697	18	.390	18	.673	29	.511
10.5	5	20	.363	21	.526	21	.845	20	.691
12.7	7	38	.783	18	.578	18	.566	38	.794
15.8	11	26	.750	19	.693	19	.776	26	.830
17.0	12	42	.878	14	.892	14	.908	42	.881

in each category so drastically, it was not meaningful to apply tests of statistical significance to differences between the correlational scores of the various age groups. However, since the obtained results are suggestive of a possible trend, they are reported herewith.

Reference to Figure 2 shows in general a steady gain with age in the ability of both boys and girls to predict the sociometric ratings given them by the opposite sex group. However, awareness of own status as conferred by the like-sex group, drops sharply for each sex in the preadolescent period (chronologically earlier in the case of girls), and rises thereafter.

With respect to awareness of others' status (Figure 3), girls exhibit a marked preadolescent decline in ability to predict the status of both the like and opposite sex groups; whereas boys with relatively minor fluctuations manifest steady growth with age in both functions.

TABLE 3

SEX DIFFERENCES IN PERCEPTION OF OTHERS' SOCIOMETRIC
STATUS BY AGE LEVELS

Age	Grade	Girls' Perception of Girls' Ratings		Girls' Perception of Boys' Ratings		Boys' Perception of Boys' Ratings		Boys' Perception of Girls' Ratings	
		N	r	N	r	N	r	N	r
8.5	3	29	.668	18	.677	18	.541	29	.634
10.5	5	20	.296	21	.483	21	.875	20	.894
12.7	7	38	.818	18	.639	18	.756	38	.880
15.8	11	26	.891	19	.944	19	.918	26	.978
17.0	12	42	.762	14	.815	14	.894	42	.885

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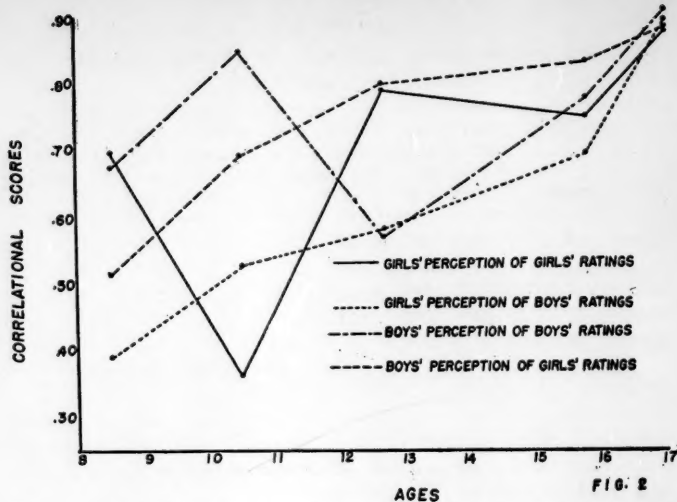


FIGURE 2—Sex differences in perception of own sociometric status for various age levels.

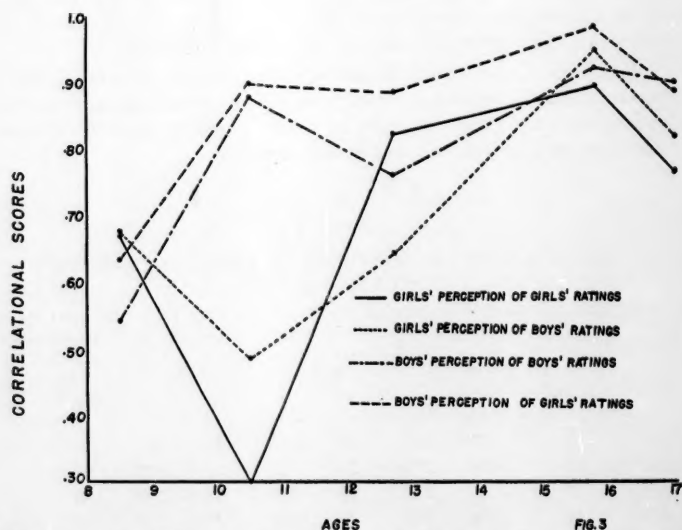


FIGURE 3—Sex differences in perception of others' sociometric status for various age levels.

Such age trends if confirmed would raise many difficulties of interpretation. They suggest the occurrence of a marked shift during the preadolescent period in the factors accounting for children's status in the group, especially in the case of girls. This interpretation would be consistent with Tryon's finding of profound changes in the qualities which girls admire in each other during the period from twelve to fifteen (43).

Sociempathic ability of teachers. In the third-, fifth-, and seventh-grade groups, teachers were asked to predict the rank order standing of each child in terms of the sociometric status he enjoyed in the class. These predictions were then correlated against actual rank order standings as determined by sociometric status scores earned on the second page of the socio-

TABLE 4
RELATIONSHIP BETWEEN TWO METHODS OF
MEASURING SOCIOMETRIC STATUS

Grade Level	r
3 .....	.726 ± .05
5 .....	.286 ± .10
7 .....	.416 ± .07
11 .....	.421 ± .08
12 .....	.490 ± .07

metric test. The resulting rank order correlations (converted into product-moment correlations) of .804, .648, and .548 for the third, fifth, and seventh grades respectively are suggestive of a trend toward a decline in teachers' sociempathic ability as the age of their pupils increases. These results support a previously reported tendency for a gradual loss in teachers' ability to judge the sociometric status of their pupils from kindergarten to sixth grade (29). Working with a group of high-school pupils, Bonney (9) also found that teachers were not very successful in identifying the degree of acceptance children accorded their classmates.

Relationship between two methods of determining sociometric status. In this study sociometric status was measured in two different ways. The first method simply indicates the frequency with which a given child was explicitly chosen by other children as one of their three best friends. Such choices are indicative of a more general emotional attitude of acceptance or rejection of another individual as a person than the more conventional sociometric method which elicits a choice in relation to a specific activity or situation. The second method of determining sociometric status does not depend on the expression of a limited number of explicit preferences (i.e., "three best friends"), but on the feelings of acceptance or rejection which every member of the group manifests toward every other group member.

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Although one might reasonably expect some positive relationship to prevail between these two different measures of sociometric status, it is apparent that the first measure only takes into account extreme positive feelings, while the second measure reflects a central tendency of a wide range of both positive and negative feelings.

The actual degree of correspondence found between the two measures as shown in Table 4 is surprisingly low except in the third-grade group. This indicates that in the older age groups there is not too much relationship between being chosen most frequently as a "best friend" and ranking high on a more general measure of popularity.

Age trends in the distribution of ratings and predictions. One of the most striking results of this study is the tendency for the distributions of all ratings and predictions (pages one, two, and three) to deviate significantly from the normal (see Table 5). This tendency exceeds, in all cases

TABLE 5
DISTRIBUTION OF RATINGS AND PREDICTIONS FOR VARIOUS GRADE
LEVELS AND DEGREE OF DIVERGENCE OF OBSERVED FROM
EXPECTED RESULTS EXPRESSED AS A VALUE OF
CHI SQUARE

	Percentage of Ratings in a Given Category					Corrected Value of Chi Square
	5	4	3	2	1	
<i>Ratings of Others</i>						
3rd Grade	35	28	18	7	11	79.0
5th Grade	44	26	17	7	6	105.0
7th Grade	22	40	17	6	5	85.1
11th Grade	17	47	28	6	2	22.5
12th Grade	14	42	31	8	5	15.1
<i>Predicted Ratings for Self</i>						
3rd Grade	32	18	29	7	14	60.6
5th Grade	42	22	22	5	9	97.6
7th Grade	20	39	28	7	6	30.8
11th Grade	15	36	42	6	1	17.6
12th Grade	7	34	44	9	4	9.0
<i>Predicted Ratings for Others</i>						
3rd Grade	29	11	27	4	19	63.0
5th Grade	41	21	22	7	9	96.4
7th Grade	28	22	32	6	12	57.7
11th Grade	19	25	32	15	9	15.3
12th Grade	7	24	32	15	12	14.6

but one, the one per cent level of significance, and invariably results from the disproportionate use of the upper portions of the rating and prediction scales, giving rise to marked negative skewness. Table 5 shows for all grade levels the percentage of total ratings falling in each of the five categories of our scale, with degree of divergence of observed from expected results expressed as a value of *chi square*.² Nevertheless, except between the third and fifth grades there is a tendency for these distributions to become more normal with age. This tendency on the part of the younger groups to over-rate themselves and their acquaintances has also been found for children's judgments of character traits (28) and socio-economic status (39). It may account in part for the relative inaccuracy of sociomphic ability at the lower age levels.

TABLE 6
SPLIT-HALF RELIABILITY OF RATINGS AND PREDICTIONS

	<i>Ratings of Others</i>	<i>Predictions of Own Status</i>	<i>Predictions of Others' Status</i>
3rd Grade .....	.743	.624	.876
5th Grade .....	.542	.115	.578
7th Grade .....	.859	.494	.704
11th Grade .....	.900	.655	.984
12th Grade .....	.890	.352	.972

RELIABILITY

Reliability of sociometric status and predictions of sociometric status. Previous studies of the stability of sociometric status have shown both a long-range constancy over a period of months and years during the elementary school period (7, 8, 10, 26) and a high test-retest reliability over a period of weeks in preadolescent and early adolescent groups (23, 31). In the present study, since a measure of test-retest reliability was not available, reliability was determined by the split-half (odd-even) method. These split-half reliabilities (with Spearman-Brown correction) shown in Table 6 reflect the consistency of an individual's sociometric status over two comparable halves of the group. For all grade levels except the fifth, the reliability coefficients are quite high.

The reliability of the predictions of own and others' sociometric status was similarly determined by a split-half technique. Prediction of others' status was found to be uniformly reliable for all grade levels except the

² Since our data are reported as per cents, the Chi Square values shown are corrected values.

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fifth, whereas prediction of own status manifested considerably less consistency over persons for all age groups. In our population, therefore, individuals were more *accurate* in predicting their own status than they were *consistent* in the predictions they made of same.

TABLE 7
SPLIT-HALF RELIABILITY OF SOCIEMPATHIC ABILITY

	Sociempathic Ability Own Status <i>r</i>	Sociempathic Ability Others' Status <i>r</i>
3rd Grade .....	.720	.578
5th Grade .....	.479	.484
7th Grade .....	.567	.469
11th Grade .....	.771	.889
12th Grade .....	.760	.714

Reliability of sociempathic ability. In this study we are naturally more concerned with the reliability of sociempathic ability, i.e., with the reliability of the correspondence between ratings and predictions than with the separate reliabilities of either ratings or predictions. It is important to know whether this ability exhibits any generality over persons. That is, if an individual is superior in accurately predicting his sociometric status as determined by the odd half of the class, does he tend to be superior in predicting his status as determined by the even half of the class? To what extent do the odd and even halves of the class correspond in ability to predict the sociometric status of the various group members? Answers to these questions are provided in Table 7 giving the corrected split-half reliabilities for sociempathic ability relative to own and others' status.

In order to determine the split-half reliability of sociempathic ability, it was first necessary to express this ability in the form of a single score for each individual which could be calculated separately from comparable halves of the data. For this purpose a discrepancy score was used indicating the degree of correspondence between actual and predicted ratings for each subject. Then by correlating the odd set of discrepancy scores against the even set, split-half reliability coefficients were obtained.

Reference to Table 7 shows that these reliability coefficients range from .469 to .889, averaging .670 and .649 respectively for the "self" and "other" accuracy functions. This degree of consistency over persons is as good as is generally found for this type of heterogeneous function. In two other studies described above, Dymond (14) reported a split-half reliability of .82 for empathic ability with respect to different traits, and Gage (18) obtained reliability coefficients of about .70 with respect to generality of empathic

ability over both test items and strangers. In both cases, however, reliability was probably enhanced by the fact that measures of accuracy were based on degree of correspondence between *individual* items (or ratings) and predictions, whereas the measure of accuracy in the present study was expressed by means of a correlation between *mean* ratings and predictions.

SUMMARY AND CONCLUSIONS

The development of sociempathic ability (perception of own and others' sociometric status) was studied by asking children from several grade levels (3-12) to rate all of their classmates on a five-point scale in terms of acceptability as friends, and to predict how each of their classmates would rate them and be rated by the group on the same basis. Accuracy of perception of own sociometric status was determined by correlating the mean ratings which individuals received from the group (their actual sociometric status) against the mean predictions they made of same. Accuracy of perception of others' sociometric status was determined by correlating the actual sociometric status of individuals against the group's predictions of same.

1. High positive correlations were found at all grade levels between measures of actual and predicted sociometric status. From inspection of the probable errors of these correlational scores it is evident that they (the scores) represent an ability to perceive own and others' sociometric status which is significantly greater than chance far beyond the one per cent level.

2. The split-half reliabilities of sociempathic ability averaged .67 and .65 for the "self" and "other" functions respectively, indicating a fair amount of consistency over persons. It would also be interesting to determine the stability of these functions on a test-retest basis.

It can be concluded therefore, that for purposes of comparing different age groups with respect to sociempathic ability, correlational scores based on the relationship between *mean* ratings and predictions are sufficiently reliable. Measures of sociempathic ability for different age groups based on the degree of correspondence between *individual* ratings and predictions are not comparable and are of doubtful validity since marked differences exist between age groups in the distribution of ratings and predictions.

3. The growth curves obtained for sociempathic ability show some indication of a trend toward increased ability with age, but this is in no sense definitive since the various age groups were not matched for sex or socioeconomic status. Through analysis of covariance, however, it was established that age is a significant factor in accounting for some of the variability between groups in sociempathic ability. It would be worthwhile, therefore, to study developmental trends in this ability with larger and more comparable groups. From preliminary results reported in this study, it would also seem more meaningful to analyze the data separately for boys and girls and for perception of status in relation to like and opposite sex groups.

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4. The method of determining the sociometric status of an individual as a mean value of the ratings of acceptance-rejection given him by all the members of a group is generally quite reliable, but except at the third-grade level correlates only indifferently with the conventional method of determining sociometric status. At the higher grade levels, therefore, factors other than general popularity with the entire group operate in causing an individual to be chosen frequently as a best friend.

5. Children at all grade levels tend disproportionately to use the upper portions of the rating and prediction scales. Although this tendency is significant for all groups at the one per cent level, there is a pronounced trend for the distributions to become progressively more normal with age.

6. There is a suggestive trend for the sociopathic ability of teachers to decrease as the age of their pupils increases.

7. It is apparent that a measure of accuracy based on the correspondence between *individual* ratings and *individual* predictions would provide a greatly refined and more meaningful expression of sociopathic ability than the present method of relating mean ratings to mean predictions. The former method would be indispensable in investigating such problems as the personality correlates of individual differences in sociopathic ability, the effects of such differences on social effectiveness, the relationship between one's degree of acceptance of an individual and the accuracy and the direction of one's predictions in relation to him, etc. The results of these types of analyses will be reported in a subsequent paper.

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SOCIOGRAPHIC ANALYSIS OF SOCIOMETRIC VALUATIONS¹

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One major task of the sciences of human behavior is to formulate working ideas that make sense of rich sets of data gathered by present-day techniques. A closely related concern is the development of methods of analysis relevant to the underlying theory. Awareness of the interplay among techniques of gathering data, methods of analysis, and theoretical framework fosters the clarification and reformulation of each element in a scientific operation. Techniques can be useful timesavers once variables have been identified and relationships have been demonstrated.

Following a theoretical orientation the present paper reports an original method of organizing and presenting sociometric data for research and professional purposes. The graphic outcome of the operations is a sociograph. It not only arranges members of the population systematically in discernible cliques and other sub-groupings but also indicates cleavages in the structure of the group being studied. Positive and negative valuations of one another by individuals within a real-life situation provide the first-order data. They are employed to obtain data cards, to yield the graphic presentation in matrix form, and to calculate indices of peer status independently of any external variables. A subsequent paper upon age-mate acceptance and indices of peer status treats the last of the three operations.

THE VALUATION CONCEPT AND RELATED THEORY

Theory provides concepts and working hypotheses to guide research and to control biases in observation and interpretation. One of our research concerns has been the discriminations, the attachments, and the value-orientations which operate in personality formation, social learning, and group behavior among children, youth, and young adults of different family backgrounds in various communities. The sociometric approach provides one important set of data. Some of our ideas and methods have been derived from the literature. Others have stemmed from our own research experiences and those of our co-workers.²

¹ Read at the annual meeting of the Society for Research in Child Development, Inc., Philadelphia, Pa., December 27 and 28, 1951.

² The authors are indebted to Willie Mae Parr, Claribelle Mink, Cherrille Patterson, Juanita Reid, and Gertrude Patterson, as well as to graduate students in research seminars, for carrying out studies which test the working hypotheses, the sociometric procedures, and the peer status construct.

Sociometric techniques yield valuation data about individuals within an identifiable grouping. In general, sociometric instruments present positive and negative descriptions with regard to some attribute or a possibility of interaction. Each individual is asked to nominate other persons within the designated grouping who fit these descriptions. The nomination of a subject (j) as a person to be included under a "positive" item by an informant (i) constitutes a positive valuation from i to j . When i nominates j under a "negative" item, the result is a negative valuation. An alternative technique is to secure a distribution of valuations by having each individual rate every other individual in the "test population" in terms of a "social distance" or a "social acceptance" scale.

Value-disvalue is a mode of experience which affects social perceptions and the behavioral relations of persons to one another. Any concept of positive and negative valuation is a generalization of such empirical notions as "choice" and "rejection" when the criterion is a specific interaction situation provided by the sociometric questionnaire (8, pp. 561-585). A "choice" usually is defined as an expressed desire on the part of a specific individual to interact with some other person. A "rejection" is an expressed desire to avoid such interaction.

A valuation may be a direct apprehension, a prediction, or a judgment of value-quality in a perceived object or class of objects (6, pp. 397-431; 3, pp. 3-6, 57-66). With regard to persons, the act of valuation requires not only awareness but also cathectic attachment and/or cognitive discrimination. In terms of a modern theory of social behavior (7, pp. 8-16), human beings have a "sensitivity" to other persons, a potentiality of perceiving or cathecting them as objects in various ways. Each individual is committed to culturally expected "selections" among objects as a consequence of social learning, or past experience carried into present situations. When the objects are persons, selections are made with respect to their potential significance to the individual concerned. Perhaps the simplest forms of this selectivity are acceptance or choice and avoidance or rejection.

Sociometric acceptance and avoidance, as instances of valuation, represent something more than "raw behavior." They denote not only present valences toward others but also past value-apprehensions in terms of learned categorizations, attachments, and expectancies about people. "Hypothesis" or "expectancy," in terms of one kind of perceptual theory (1), is a mechanism which mediates between "life history" variables and cognitive processes. Our observations of variation in valuation according to family background and other experience variables would tend to support the more general theory.²

² According to another type of theory, which involves a psychological model (9, pp. 277-361), human beings have a generalized "placing" need which activates a belief-value matrix. Learning and psychodynamic mechanisms, such as identification, bring about a readiness to select or "go to" certain types of persons (positive valuing) and a concomitant readiness to avoid or "go away from" other persons (negative valuing).

Important consequences follow this conception of sociometric valuations, always providing it has a demonstrable basis in reality. Given a range of sociometric stimulus situations, one can derive valuable information about each informant in terms of the "immediate behavior space" and the learned tendency to go toward or away from, to accept or reject, to approve or disapprove, or to value or disvalue certain types of individuals in each item context. Experience with various kinds of item-pairs tends to confirm the proposition that the kinds of j 's nominated by i tell something about i , especially when further information is available on the persons nominated and their place in the total group structure.

Part of the necessary information is provided by gathering and analyzing the positive and negative valuations received by each individual as a subject (j). Nominations, according to the theory outlined above, are an outcome of selective experience with other persons carried into the present series of social stimulus situations. Convergence of assessments, then, represents a pooled judgment of observers in what approximates a sequential sampling situation. For instance, if the item pairs are constructed with care to elicit acceptance and avoidance valuations, measures of peer status or level of acceptance for each individual in the population are possible. As another example, if the stimulus questions are designed adequately to draw nominations for personality attributes or operational qualities, interpretations of role behavior have a likelihood of being both reliable and valid (10, pp. 77-81).

Finally, sociometric valuations permit a study of group structure, particularly sub-groupings and role behaviors as they shift through time. Concepts of the "sociogroup" and the "psychegroup" (5, pp. 278-287), based upon the degree of mutuality of choice, and measures such as "group cohesion" and "group coherence" (2) stem from this approach. Our concern, however, has been the young person in his immediate age-mate society. Attention has been directed toward the determination of cleavages, the analysis of subgroups, the interpretation of social-sex roles according to age-grade, and the identification of variables associated with the nature and level of acceptance in certain situations and among representative populations. Sociographic analysis provides a basic method of systematically organizing valuation data toward this end.

AN ILLUSTRATIVE SOCIOGRAPH

A simple illustration may facilitate explanation of the sociographic method as it is applied to acceptance and attachment data. The operations and the underlying principles have been applied in the analysis of data from much larger populations by both authors and their co-workers. The illustrative sociograph is derived from positive and negative valuations expressed in an eighth grade classroom at a research center known as Gulfside. For

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the particular data set, 25 children have named their three best friends and the three members of the class liked least. By following a procedure to be outlined in subsequent sections, the sociometric valuations have been organized in a sociographic sequence and plotted on the matrix graph, Figure 1.

The valuations made by each individual as an informant (*i*) are in the vertical columns. The positive and negative assessments directed toward

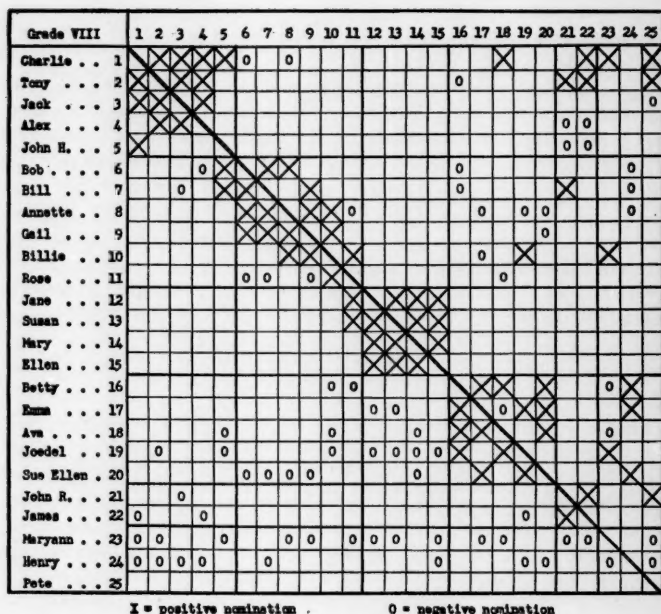


FIGURE 1

each individual as subject (*j*) may be read in the horizontal rows. A positive nomination is indicated by the symbol X, and O marks a negative mention. A diagonal line runs through the squares which otherwise would represent each person's feelings toward himself. Clusters of X's along the diagonal indicate the subgroup formations in the eighth grade at the particular time of the year. Valuations entered at the corners of any "square of squares" crossed by the diagonal are reciprocal expressions of mutual acceptance, avoidance-acceptance, and mutual avoidance. For example, Charlie and Tony express mutual acceptance; Ava and Emma reflect avoidance-acceptance; and Ava and Maryann, mutual avoidance.

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Lines of cleavage denote "break-points" in the group structure where positive inter-valuation is at a minimum and negative nominations indicate either the closing of one level or the beginning of another. Only a few decisions have to be made after the sociographic sequence is established. For instance, John H. could be included either in level VI (the highest one) or level V. Since his selection of Charlie is returned, he is left as a fringer

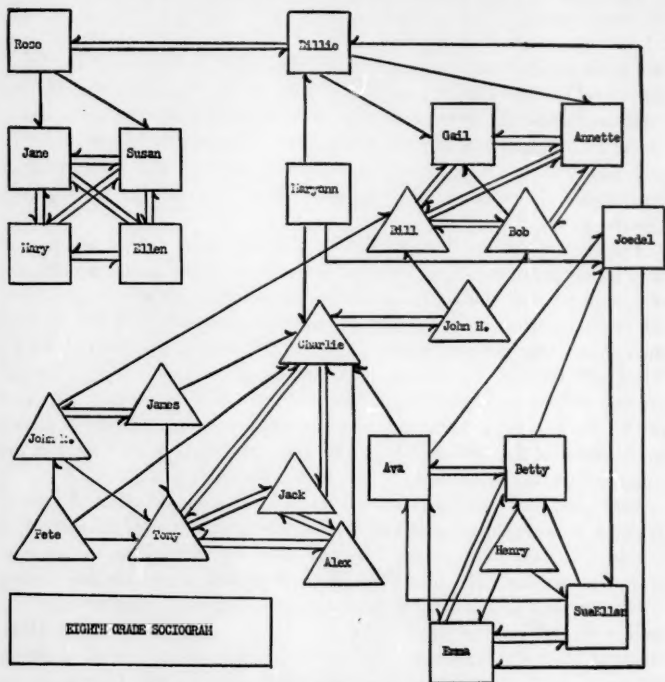


FIGURE 2

in the top-level subgroup of boys. His positive valuations of Bob (who negates Charlie and is negated by Alex) and Bill (avoided by Jack) tie the first two levels together. Rose occupies a similar position fringing at the second level. Three level V members negatively value her, indicating potential interaction in the second subgroup of boys and girls.

What kinds of interpretations may be made from the sociographic matrix before further analysis is undertaken? ⁴ The sociographic levels, separated

⁴ Peer status scores usually are placed to the right. The procedure is explained in a subsequent report, "Age-Mate Acceptance and Indices of Peer Status."

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by cleavage lines, denote subgroups and acceptance-avoidance patterns. From their place in the group structure, and valuations made by and directed toward them, predictions about individuals are possible in the light of previously outlined theory. Experience has shown us that a number of the interpretations can be confirmed independently by observation, focused interview, and behavior sampling data.

The illustrative matrix could be representative of an incipient breakdown of earlier cleavage by sex—a common dynamic of group behavior in early adolescence. At the top are boys, oriented to Charlie; next are mixed boys and girls, valuing one another; then separated girls, a tightly woven clique, form level IV. The girls at level III not only receive more than the expected number of avoidance mentions but also they direct their negative nominations to the two highest and the lowest segments. The friendship pair, John R. and James, are the prototype of such relations at a similar level in larger populations. At the bottom, in level I, are the anti-foci and the isolate, Pete, ignored by his classmates.

The specific information revealed by the sociograph is difficult to read on a sociogram drawn from the same sociometric data. Figure 2 is one form of a sociogram of the eighth grade illustrative case. To eliminate half of the confusing arrows, the negative nominations are omitted. Where is Pete, the isolate? One has the impression, when Pete is discovered near John R., Tony, and Charlie (his choices), that he belongs to such a group. Yet the position reflects merely his desire (also represented on the sociograph) and not his place in the acceptance system. As another instance, Henry is placed in the center of the bottom girls' clique because he elects to be there. But the subgroup actually is a closed one and does not include Henry.

There are, then, important differences between a sociograph and a sociogram. A sociograph is constructed objectively to show where an individual is accepted rather than where he prefers to be. In a sociogram the separate groupings are noticeable but they do not represent a measureable reality. As Proctor and Loomis (8) have pointed out, adequate interpretation of a sociogram is dependent upon the knowledge of variables other than those obtained from the sociometric questionnaire. Any other person drawing the sociogram might choose another arrangement for the individuals or sub-groupings. When the sociographic sequence is followed, any other investigator would have difficulty in constructing a substantially different graphic representation.

DETERMINING THE SOCIOGRAPHIC SEQUENCE

The sociographic sequence is derived from the original valuation data in three simple operations. When a sociometric instrument is employed, stimulus questions such as the following are interspersed among others designed to obtain different kinds of information:

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- A. 1. Who are the ones you would prefer to run around with most of the time?
- 2. Who are the ones with whom you would prefer almost never to run around?
- B. 3. Who are the boys and girls you would prefer to have along if you were going to a party this weekend?
- 4. Who are the ones you might not prefer to have along?
They could go elsewhere.
- C. 5. Who are the ones you probably would choose for your very best friends?
- 6. Who are the ones you probably would not choose for your very best friends?

Additional item-pairs in the acceptance-avoidance framework furnish a cross-check for estimating reliability of the nominations.⁵ Other kinds of item-pairs in the questionnaire usually are concerned with social identification data, role behaviors, psychological attributes, value-orientations, and models for identification and imitation in social learning.

The first operation involves the transfer of nominations to data cards. Eight by five inch cards may be printed or mimeographed with spaces at the top for name, code number, and identification data.⁶ The top part has spaces for positive valuations (PV) and negative valuations (NV) made by the individual as informant. The bottom part, and the reverse side if necessary, has spaces for positive valuations received (PVR) and negative valuations received (NVR) by the individual as subject. Such cards may be employed by the investigator to record any set of item-pairs.

The second step is time-consuming in large populations but rewarding in terms of research insight. It requires the transfer of the name of the informant (*i*) to the cards of each person he has nominated positively or negatively as a subject (*j*). A completed card may be illustrated in short form by taking Charlie (Figure 1) as an instance where choices and rejections are limited to three.⁷

⁵ Any information about how group members apprehend or judge one another may be employed as the basis for sociographic structuring. Matrices have been constructed from interview material, observations of group interaction, records of dating, and anecdotal records. Similarities in subgroups and cleavages appear when interview and sociometric data are graphed.

⁶ Identification data often include sex, age, school grade, I.Q., family status (ISC), and ethnicity (for example, Latin-American).

⁷ Completed studies indicate that sociographic matrices have similar sub-groupings and cleavages when nominations are unlimited. Matrices based upon positive choices alone are possible but there are difficulties in establishing cleavages and peer status indices.

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PV: Tony, Jack, John H.	NV: James, Maryann, Henry
PVR: Tony, Jack, John H., Ava, Alex, James, Maryann, Pete	NVR: Bob, Annette

A sociographic score is calculated directly from the entries. The formula is simple: PVR plus MPV minus NVR. In the case of Charlie, there are three mutual positive valuations (MPV). Hence Charlie's sociographic score is: $8 \text{ PVR} + 3 \text{ MPV} - 2 \text{ NVR} = 9$, the highest among classroom members. Usually scores are entered in a prepared place on each card.

The third operation establishes the sociographic sequence for the population studied.⁸ The sequence automatically determines the order in which the names of informants are to appear in the matrix. The individual with the highest sociographic score becomes *one* in the sequence. His name and those of his positive nominations are recorded in a *working list* and his card is numbered *1* in the *sociographic sequence*. Number *two* in the sociographic sequence is the first person listed by *one*. Nominations submitted by *two* are added to the working list, check marks being employed if the name already has appeared upon the list. The first name chosen by both informants becomes *three* in the sequence. If there are no duplicated choices the third name on the list becomes *three* and, in either case, his nominations are added to the working list.

The beginning of the operation may be illustrated by referring to the initial steps determining the sequence appearing in Figure 1.

Charlie nominates Tony, Jack, and John H.

Tony nominates Alex, Charlie, and Jack.

Jack nominates Tony, Alex, and Charlie.

<i>Working List</i>	<i>Sociographic Sequence</i>
Charlie ✓ ✓	1. Charlie
Tony ✓	2. Tony
Jack ✓	3. Jack
John H.	4. Alex
Alex ✓	

Alex becomes the fourth name in the sociographic sequence because he has received more mentions in the working list than John H.

⁸ Populations studied so far have been classroom groupings in elementary schools and age-mate societies including youth in and out of secondary schools. The highest number to appear upon a graph to date is 217 persons.

The process of adding informants' nominations and selecting most mentioned names for the sequence continues until no more names are added to the working list. For instance, in the illustrative example, Ellen becomes *fifteen* both on the working list and in the sociographic sequence. Fifteen data cards have been numbered and set aside in an objective sequence. A primary cleavage has appeared for no further positive valuations have been made in the data cards.

A primary cleavage is the signal for a new working list to continue the sociographic sequences. Among the remaining cards, the one with the highest sociographic score is located and the process is repeated until another primary cleavage appears. For example, in Figure 1, Betty begins a new working list which closes with Sue Ellen as *twenty* in the sequence. When all the cards showing PVR have been placed in sequence, the remaining ones contain only NVR or no valuations whatever. Individuals with NVR are placed before those with neither negative nor positive nominations because they are subjects of value-disvalue.⁹ The non-valued members, on the other hand, are socially and psychologically isolated.

Objective determination of a sequence is the unique step in constructing a sociograph. The rationale can be stated in four working hypotheses when the valuation patterns expressed by informants are in terms of acceptance.

1. In a social organization, a member potentially shares the status of the highest ranking person who values him positively.
2. The degree to which a person shares a given status rank is a function of valuations directed to him by members at that level.
3. A rank sequence results if individuals are listed in the order they are most often positively valued by higher ranking members.
4. The individual receiving the highest balance of positive valuations from other members has the most status in the population or subgroup.

Nominations appearing on the sociograph are positive and negative judgments pooled from a sample population. The postulates reduce the method of evaluated participation, devised for stratifying people in communities (11, pp. 47-117), to the limits of relationships within a smaller grouping. In terms of theory outlined earlier, both present valences toward one another and value-apprehensions from past experience are involved. The pooled judgments are samples from a behavioral universe which has continuity. Consequently either analytical or statistical inferences may be made from the resulting sociograph.

⁹ Usually only a small proportion of individuals in the population remain. Some prefer to arrange cards containing only NVR entries by the decreasing number of valuations listed—assuming most attention directed as a sequence criterion. Others prefer to order the cards from fewest to largest number of NVR nominations to indicate degree of non-acceptance.

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CONSTRUCTION OF A SOCIOGRAPH

Most sociographs are elaborations of the simple model shown in Figure 1. When larger populations are involved, the number of persons at each sociographic level increases. The design remains the same. Names or code numbers are listed in sociographic sequence across the top of a graph (as informants) and at the left side (as subjects). A diagonal line is drawn through the squares which correspond to the same name vertically and horizontally. Entries are made from the sequence of data cards. Positive and negative valuations are recorded from i to j , the ij valuation being entered where column and row intersect.

Next, cleavage lines are determined to separate the several sociographic levels. Primary cleavages already are known from the "break-points" in the sociographic sequence and the lines can be drawn immediately. Secondary cleavages separate sub-groupings between whose members there is a minimum of positive valuation. Linking individuals, for instance, John H. (5) and Rose (11) in Figure 1, are left as fringers in the higher level if they are reciprocally chosen there. In all other cases, lines of cleavage are placed so that positive valuations across them are at a minimum in terms of observed compared with potentially expected frequencies.

Sociographic levels are determined by the lines of cleavage. They are numbered from the bottom (level I) to the top (level VI in Figure 1). The numbering facilitates later calculation of an index of peer status because level of acceptance of each i is a factor weighting the j 's directed to each subject. In practice, the number of levels ranges from three (in some primary classroom groupings) to six (in large age-mate societies). When the populations are large, several subgroups may appear between two cleavage lines since secondary cleavages often are ignored to keep the number of levels at six or less. For instance, in a larger sociograph, the names from Charlie (1) to Ellen (15) would appear within one level. The three subgroups, however, still would be apparent in terms of clusters about the diagonal.

DISCUSSION

Within a limited space it is possible only to discuss certain facets of the theory and practice of sociographic analysis. Much has to be left to subsequent research reports. For example, studies of reliability have been made which show a significant degree of agreement among sociographs for "friendship," "work," and "play" stimulus questions. Validity has been demonstrated, at least in part, by obtaining data on acceptance levels and clique behavior through interviewing and other non-sociometric techniques.

Six studies involving repeated administrations of a sociometric questionnaire have been completed. Series of sociographs over a period of one or more years show systematic patterns and changes in the subgroup structure,

including acceptance of particular individuals. Two comparable populations in separate research centers appear to have similar patterns of consistency and change. There seem to be, moreover, repeated correlates of relative position in the sociographic matrix when individuals are studied.

Comparisons indicate that the sociograph has advantages over the various forms of sociogram as a means of graphical analysis. A subsequent paper on age-mate acceptance and indices of peer status is designed to show that the sociograph facilitates index analysis when measures for individuals are desired. Not only is group structure diagrammed in an objective manner but also the various indices sociometrists have originated may be calculated either from the matrix or the original data cards. The cleavage lines facilitate statistical studies of subgroups within and among populations (8). In matrix analysis, for the Forsyth and Katz approach (4), the sociograph automatically pushes the majority of negative valuations away from the main diagonal and makes the positive ones cluster around it. Consequently the method facilitates most types of analysis.

SUMMARY

Following a discussion of the valuation concept and underlying theory, an original method of organizing and presenting sociometric data has been described. The sociograph, which is the graphic outcome of the procedure, not only arranges the subjects systematically in discernible cliques and other subgroups but also indicates cleavages in the group structure of the population studied. The sociographic matrices are reproducible and, along with the derived measures to be described in later papers, are comparable over successive administrations or between different populations. Finally, the data are presented in a form suitable for any of the present types of sociometric analysis.

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AGE-MATE ACCEPTANCE AND INDICES OF PEER STATUS¹

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Being accepted by, being peripheral to, or being rejected by age-mates has an impact upon children and adolescents. The concomitants of acceptance appear to be a significant source of variation in learning, in role behavior, and in several aspects of personality formation. Each young person modifies his need-dispositions (3, pp. 8-10, 91-98, 114-120) and ego-involvements (5, pp. 92-153) with others, his adaptive anxiety and value-orientations, according to the nature and extent of his experiences with those about his own age. In other words, motivations underlying behavior—overt and covert—are shaped in the age-mate context as well as in the family and in local adult-controlled institutions such as the school and the church.

Indices are constructs which represent some essential part of a reality that we wish to approximate for analytical purposes. Generally speaking, concepts are clarified and become a part of day-to-day research when indices are established for the variables being considered (1, p. 109). An index of peer status is merely a mathematical construct which attempts to represent a boy's or girl's level of acceptance among age-mates. The acceptance, in turn, is an observable fact which symbolizes aspects of learning and motivation which escape us. We substitute the pooled judgments of others for more detailed, time-consuming clinical appraisals. The working hypothesis is that one's socialization and motivational orientations are similar, in certain essential respects, to those of other people of approximately the same status.²

Two indices of peer status are to be explained and illustrated. Each has been tested in a preliminary way as an operational construct in research to be reported. Our purpose in the present paper, however, is to describe the derivation of the two measures and to show how they have been employed in studying young people and their groupings. Data demonstrating reliability and validity, other than agreement among procedures, as well as relationships to other variables, are to be presented in subsequent accounts of investigations.

¹ Read at the annual meeting of the Society for Research in Child Development, Inc., Philadelphia, Pa., December 27 and 28, 1951.

² The working hypothesis follows from the theory presented in the opening section of the preceding paper, "Sociographic Analysis of Sociometric Valuations."

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DERIVATION OF THE INDICES OF PEER STATUS

Mathematical formulations are based upon postulates made by men. The properties of indices, then, are consequences of the basic assumptions underlying them. If the essential elements of the situation are taken into account, the mathematical approximation may give an adequate idea of reality for certain purposes. In a sense, the indices of peer status are such mathematical constructs for the estimation of age-mate acceptance.

Raw valuation data appear as frequencies of positive and negative nomination. Little or no regard usually is paid to essential attributes of the person who made the valuation and the individual toward whom it is directed. Further, frequency distributions often assume a Poisson or binomial form and a transformation is necessary to have the mean and variance independent for most kinds of statistical analysis (6, pp. 445-461). For these and other reasons, we have sought suitable index transformations to represent acceptance-avoidance and other valuation data about individuals.

An important clue has been provided by Zeleny (8, 9) as to what form the indices might take. Zeleny has been among the first sociometrists to develop indices which would permit the measurement of interpersonal attitudes in a group structure. His *social status index* is a measure of the average intensity of attitudes ("attractions" and "repulsions") expressed toward a person, together with " \pm the average deviation of intensities" in a particular group context. The essential form of Zeleny's equations and subsequent variations may be represented in a formula:

$$SS = \bar{Y} \pm D = \frac{\text{Sum } I}{n} \pm \frac{\text{Sum } d}{n}$$

In the formula, I equals the intensity of an attitude (attraction or repulsion) expressed toward a person, n the total number of attitudes, and d the deviation of any one attitude from the mean of all the attitudes.

The element of "choice-rejection" is an essential one in determining status relationships which appear to be outward symbols of underlying similarities in ideas, beliefs, and value orientations. Hence Zeleny's procedure provides a guide for the drafting of potential indices to represent level of acceptance. Only two have withstood the various tests employed to determine their usefulness in research.

The first index of peer status is one we term a *class-weighted index*. The family background of the informant (i) who directs valuations toward the subject (j) is taken into account. The form of the construct has been influenced by the necessity of having some "external" criterion to weight nominations since it was developed before the sociographic matrix was devised. The second form of the index requires no other information than that contained in the sociographic matrix. For this reason we term it the *sociographic index*.

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THE CLASS-WEIGHTED INDEX OF PEER STATUS

Three working hypotheses have determined the form of the original index which depends upon the rank value of family background to weight nominations. The postulates follow from previously stated theory.

1. Valuations of others, such as choices and rejections, serve to "place" individuals in a pattern of status relationships which take the form of levels of acceptance in a population.
2. Attitudes, especially those of affiliation and avoidance, expressed toward others have approximate weights corresponding to the family "social class" status of the informant (*i*) so as to reflect the influence of community status-structure upon a group structure (2).
3. A *correction factor* added to, or subtracted from, the "status-weighted" *valuation factor* serves to balance differences in family background, to take account of "positive" avoidance,³ and to achieve a representative distribution of *index scores*.

The criterion for accepting the hypotheses, of course, is how closely the resulting index approximates the peer status patterns or acceptance levels which actually exist in a classroom or an age-mate society.

The original *index of peer status* appears in the class-weighted form on Plate I. In the formula the first term is the valuation factor and the second is known as the correction factor.

$$IPSC = \frac{PVR_C - NVR_C}{N} \pm \frac{D_C}{N}$$

The nominations directed toward the subject (*j*), whether positive (PVR) or negative (NVR), always are weighted by the inverse status-rank of the informant (*i*). In practice, an ISC or index of status characteristics (7, pp. 39-43, 121-158), is calculated for each member of the population to estimate the family social class status.⁴ An upper class boy or girl receives a rank value of 5, upper-middle 4, lower-middle 3, upper-lower 2, and lower-lower 1. Thus, for determination of the valuation factor in the index, each nomination is multiplied by a status-weight. The algebraic sum of weighted positive and negative valuations is divided by the total number of nominations to obtain a mean value which may be positive or negative.

³ A "positive" avoidance is a negative valuation which arises out of recognition of a superordinate position. The negative nomination *i* directed to *j* has to be balanced by a positive value in the correction factor.

⁴ The Warner ISC depends upon ratings for parental occupation, source of income, dwelling area, and housing type. When the latter two factors are unknown, we employ an IVO, or index of value-orientations, rating for education, religious affiliation, parental occupation, and source of income.

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PLATE I

INDICES OF PEER STATUS

Class-Weighted Index:

$$IPS_C = \frac{PVR_C - NVR_C}{N} \pm \frac{D_C}{N}$$

PVR_C = positive valuations to j weighted by family status rank of i .

NVR_C = negative valuations to j weighted by family status rank of i .

D_C = absolute deviation in ranks of family statuses of i from j .

N = total number of nominations to j but not less than median number of positive valuations in the population.

i = informant j = subject

Class-weights: A or UC = 5; B or UM = 4; C or LM = 3;

D or UL = 2; E or LL = 1

CASE 10D:

(Girl)

$$\begin{aligned} IPS_C &= \frac{(3 + 2 + 3 + 3 + 2) - (3 + 2 + 1 + 2)}{9} \\ &\quad + \frac{(1 + 0 + 1 + 1 + 0 + 1 + 0 + 1 + 0)}{9} \\ &= 0.5 + 0.5 = 1.0 \end{aligned}$$

Sociographic Index:

$$IPS_S = \frac{PVR_S - NVR_S}{N} \pm \frac{D_S}{N}$$

PVR_S = positive valuations to j weighted by sociographic level of i .

NVR_S = negative valuations to j weighted by sociographic level of i .

D_S = absolute deviation of sociographic levels of i from j .

N = total number of nominations to j but not less than the median number of positive valuations from i to j in the population.

CHARLIE:

(VI)

$$\begin{aligned} IPS_S &= \frac{4(6) + 1(3) + 1(2) + 2(1) - 2(5)}{10} \\ &\quad + \frac{4(0) + 1(3) + 1(4) + 2(5) + 2(1)}{10} \\ &= 2.1 + 1.9 = 4.0 \end{aligned}$$

If the valuation factor is positive, the correction factor is added to it; if it is negative, the correction factor is subtracted. The rank deviations between i and j are added; that is, the negative signs are neglected within the correction factor. The result is a measure of the range of persons who value the subject, positively or negatively. A subject who receives nominations from persons of the same kind of family background has a smaller index score, one nearer zero, than the one who is appraised by individuals of other experience contexts.

The N never is less than the median number of positive valuations from i to j in the grouping studied. The provision minimizes the index scores of those who receive only a few "choices" or "rejections" compared with those who receive wider attention. In general, as the N increases over a minimum, the index tends to become stable for any individual. Added valuations fail to change it materially.

An example serves to provide a model for the calculations required. The data card of an upper-lower class girl contains PVR's from seven age-mates (UL, UM, UL, LM, LL, UM, LM) and NVR's from three (UL, LL, UL). The index equation is solved by putting in the numerical equivalents.

$$\begin{aligned} \text{IPSC} &= \frac{(2 + 4 + 2 + 3 + 1 + 4 + 3) - (2 + 1 + 2)}{10} \\ &\quad \pm \frac{(0 + 2 + 0 + 1 + 1 + 2 + 1 + 0 + 1 + 0)}{10} \\ &= (19 - 5)/10 \pm 8/10 = 1.4 + 0.8 = 2.2 \end{aligned}$$

If the "choices" and "rejections" were to be reversed, the latter part of the equation for the upper-lower class girl would be:

$$\text{IPSC} = (5 - 19)/10 \pm 8/10 = -1.4 - 0.8 = -2.2$$

Being valued by persons of other home backgrounds than her own (UL) makes the score higher, and lower in the negative case, than it would be if all the informants had belonged to the same family status.

Thorough statistical analysis of the behavior of the index, employing chi-square, variance, and covariance techniques, has been carried out in three age-mate populations. Sociometric valuations at fourteen and sixteen years in one age-group, at sixteen in another adolescent society, with sociometric data at fourteen and interview nominations at eighteen in a third sample population, have provided five data sets for study. The number of indices calculated is 453, varying from 56 to 134 in a data set.

Inferences drawn from analysis of peer status data may be summarized without presenting the statistical calculations involved.

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1. An important element of the mathematical approximation defined as peer status would appear to be representative of normal variates. Among subclasses and samples taken at random, index values have comparable means and variances. With the exception of variations to be noted, similar results could be expected in other sample populations.
2. As a population grows older there is an increase in the positive values among score distributions. The age-graded effect appears to represent shifts in acceptance patterns within a peer culture which parallel changes in age. It probably is a consequence of many lower class youth "dropping out" of school, becoming affiliated with a deviant peer culture, or entering the adult world in their teens and not being available for study. A larger proportion of middle class youth remain affiliated with the dominant age-mate cultural pattern.
3. Composition of the age-group according to family social class backgrounds influences the distributions, means, and variances of peer status scores. A sample population with relatively more upper and upper-middle class boys and girls, as might be expected, tends to have a wider range of index values than one with relatively few status ranks.

Although the age-grade and family status effects are significant at the one per cent level, according to analysis of variance, they account for only a portion of the variation in the index scores. Statistically speaking, there is an "entanglement" between age-group and status effect in the index. The major portion of the variance, however, is due to variations in acceptance within the population. The age-group and family status portions tend to represent the nature of one grouping compared with another.

The peer status of a boy or girl does not necessarily correspond to the social class level of his or her family. One might expect a correlation because of the family status loading in the index. The association between the two constructs, $IPSC$ and ISC , is significant but it accounts for a minor part of the variance. The correlation decreases with age. For instance, at age 14, among 87 boys and girls, the correlation was .457—about 20 per cent of the variance. At age 16, the coefficient was .325 among 136 teenagers. At age 18, the association had dropped to .297 among a sample of 96 young people.

If the index of peer status is for the most part independent of family status, it follows that youth of low family status may enjoy high acceptance among age-mates. Time and again this fact has been observed. When they have taken over behaviors and ideas, beliefs and value-orientations, of their high status age-mates, such youth may be regarded as *climbers* if they are operating easily among their peers. Young people who are from lower class families and who are only tentatively accepted could be looked upon as *strainers* pending a more thorough psychological study. When family back-

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ground and peer status have the same relative value, be it high, medium, or low, the young person is potentially a *static* individual.

Adolescents from upper-middle and lower-middle class families do not necessarily enjoy age-mate acceptance. A number are peripheral to or isolated from their peers. They are said to be *clingers* unless they adopt non-acceptable, deviant behavior. In the latter case they are looked upon as po-

TABLE I

INDEX RANGES AND INTERVAL RATINGS FOR PEER STATUS LEVELS
ACCORDING TO A THEORETICAL "GENERAL" DISTRIBUTION

Peer Status Level	Index Score Intervals	Interval M-Score†	Theoretical "General" Sigma Distribution*
I	+4.3 plus	1	+1.67 plus
	+3.1 to +4.2	2	+1.01 to +1.66
II	+1.9 to +3.0	3	+0.34 to +1.00
III	+0.7 to +1.8	4	-0.33 to +0.33
IV	-0.6 to +0.6	5	-1.00 to -0.34
V	-1.8 to -0.7	6	-1.66 to -1.01
	-1.9 minus	7	-1.67 minus

* The theoretical sigma distribution for adolescent populations does not correspond exactly to the index score intervals 5, 6, and 7 because adjustments have been made to correspond with empirical data. The break-point for the IPS distribution theoretically should be -0.5 instead of -0.6 if score intervals of 1.2 points were maintained.

† The M-scores are employed in statistical analysis of index data.

tential *decliners*. The index of peer status serves to identify boys and girls in the latter two categories. In general, they and the youth in the *strainer* category are the ones who could profit by counseling.⁵

Experience with the index has led to the establishment of provisional levels of acceptance shown in Table I. The index score intervals are of some value in comparing one sample population with another. The table for any particular population might vary, however, according to the family social levels represented. For example, in a population of lower-lower, upper-lower, and lower-middle young people, an index score of +3.1 or greater is rare. Hence, for local studies, break-points are shifted.

⁵ Youth in the five mobility orientation categories have been studied intensively and a later paper is to report upon the research.

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By the time boys and girls move from the children's world into early adolescence, level of acceptance takes on new meaning. Through the teenage years the majority "place" one another in categories. Peer status level has some predictive value for estimating the grouping to which a boy or girl might belong. Classifications such as the following are employed by the young people to designate levels of acceptance.

- I. Wheels "the active ones," "the top crowd."
- II. Brains "students," "good kids, but they don't know the score."
- III. Outsiders .. "they get around," "skaters," "not in the crowd."
- IV. Mice "quiet ones," "inoffensive," "seldom heard."
- V. Outcasts ... "you don't want to be with them."

Apparently there are three kinds of "outcast" according to interview data. A "drip" is a would-be "wheel" who is said to make one uncomfortable. A "dope" is a would-be "brain" who arouses antagonism. The other "outcasts" usually are regarded as "wild ones" or by a name which devalues them.

The original peer status index, then, has some promise in terms of research findings to date. From index scores, it is possible to predict the probable acceptance of a boy or girl. Comparisons of peer status with family status supply estimates of potential mobility orientation. Shifts in index values usually reflect changes in individuals and in group structure.

THE SOCIOGRAPHIC INDEX OF PEER STATUS

The *sociographic index of peer status* is a more recent development made possible by the sociographic matrix described in the preceding paper. Lines of cleavage in the matrix establish sociographic levels, usually four to six in number. The several levels provide an "internal" means of weighting positive and negative nominations from i to j according to level rank, beginning with the lowest. The result is an index independent of any "external" information such as family status.

The major change in working hypotheses for the sociographic index, compared with the class-weighted one, is in the second postulate: "Attitudes expressed toward others, especially those of affiliation and avoidance, have approximate weights corresponding to the sociographic level of the informant (i) so as to reflect the influence of subgroup membership upon a group structure." The resultant index is valuable in investigations where classroom groupings or age-mate populations are from neighborhoods, suburban communities, or small towns with little range in family socio-economic status or life style.

The index of peer status is shown in the sociographic form on Plate I. Again the first term is the valuation factor and the second is the correction

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factor. The subscript, S , denotes a weighting of the positive (PVR) and negative (NVR) nominations by sociographic level of each informant.

$$IPS_S = \frac{PVR_S - NVR_S}{N} \pm \frac{D_S}{N}$$

The index usually is calculated directly from the valuation data recorded on the sociograph. The sociograph need not be drawn for large populations,

TABLE 2

SOCIOGRAPHIC SCORES, SOCIOGRAPHIC AND CLASS-WEIGHTED INDICES OF PEER STATUS IN A CLASSROOM GROUPING *

Seq. No.	Name	Family Status	Socio- graphic Level	Sociographic Score				Indices	
				PVR	MPV	NVR	SSc	IPS _S	IPS _C
1.	Charles ...	LM	VI	8	3	2	9	4.0	2.2
2.	Tony	UL	..	6	3	1	8	5.1	2.0
3.	Jack	LM	..	3	3	1	5	5.5	2.0
4.	Alex	UL	..	2	2	2	2	4.0	1.0
5.	John H. ...	UL	..	1	1	2	0	3.3	0.5
6.	Bob	UL	V	3	2	3	2	2.3	0.3
7.	Bill	LM	.	4	2	3	3	2.7	1.0
8.	Annette ...	UL	.	4	3	5	2	1.6	0.6
9.	Gail	UL	.	4	3	1	6	3.8	2.0
10.	Billie	UL	.	5	3	1	7	4.0	1.6
11.	Rose	LL	.	1	1	4	-2	-3.0	-2.6
12.	Jane	UL	IV	4	3	0	7	4.5	3.0
13.	Susan	LM	..	4	3	0	7	4.5	3.0
14.	Mary	UL	..	3	3	0	6	4.0	2.5
15.	Ellen	LM	..	3	3	0	6	4.0	2.2
16.	Betty	UL	III	4	2	3	3	-1.2	0.8
17.	Emma	LL	...	4	2	3	3	-0.7	1.0
18.	Ava	UL	...	3	1	4	0	-2.1	-0.8
19.	Joedel	UL	...	3	0	7	-4	-3.3	-1.2
20.	Sue Ellen ..	LL	...	3	1	5	-1	-3.5	-2.0
21.	John R. ...	UL	II	2	1	1	2	-2.6	0.5
22.	James	LL	..	1	1	-3	-1	-5.5	-2.0
23.	Maryann ..	LL	I	0	0	-14	-14	-7.0	-3.0
24.	Henry	UL	.	0	0	-10	-10	-7.2	-2.8
25.	Pete	UL	.	0	0	0	0	i.0	i.0

* The table has been calculated from the illustrative sociograph in a preceding article, "Sociographic Analysis of Sociometric Valuations."

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however, if level is marked on each person's card when the sociographic sequence is determined and the investigator is willing to look up the sociographic level of each informant.

Sociographic scores, the sociographic indices, and the class-weighted indices may be compared in a small sample population by referring to Table 2. The several values for each of the twenty-five classroom members have been calculated directly from the illustrative sociograph which appears in the preceding report. The only "external" information, required for calculating the class-weighted index (IPS_C), is family status for each one.

Charles, for example, is a member of sociographic level VI at the top of the matrix. His sociographic score (SS_C) is 9, determined by adding the positive (PVR) and mutual valuations (MPV) and subtracting the negative nominations (NVR). His sociographic index is determined as follows:

$$\begin{aligned}
 PVR_S & \dots\dots 4 \text{ from level VI} \dots\dots (4 \times 6) = 24 \\
 & \quad 1 \text{ from level III} \dots\dots (1 \times 3) = 3 \\
 & \quad 1 \text{ from level II} \dots\dots (1 \times 2) = 2 \\
 & \quad 2 \text{ from level I} \dots\dots (2 \times 1) = 2 \dots\dots 31 \\
 NVR_S & \dots\dots 2 \text{ from level V} \dots\dots (2 \times 5) \dots\dots 10 \\
 D_S & \dots\dots (4 \times 0) + (1 \times 3) + (1 \times 4) + (2 \times 5) + (2 \times 1) = 19
 \end{aligned}$$

$$IPS_S = \frac{31 - 10}{10} + \frac{19}{10} = 2.1 + 1.9 = 4.0$$

The class-weighted index, of course, has been calculated by taking account of the family status of each informant as described earlier. The IPS_C value, 2.2, is considerably less than the IPS_S value, 4.0, a consequence of the limited range of family backgrounds in the sample population. The entries for each of the other children have been determined in the same manner. Only one person, Pete, has been ignored in making valuations. His indices show the notation, *i.o.*, indicating that he is an "isolate."

The data ordered in Table 2 show a high degree of intercorrelation—higher than any of our age-mate studies. Zero order coefficients above .8 represent the relation between sociographic score and either the sociographic index or the class-weighted one. A correlation above .9 holds between IPS_S and IPS_C . Any correlation between the table values has a spurious element, however, for each index is based in part upon the number of positive and negative valuations directed toward an informant. A partial correlation of approximately .5 exists between the sociographic and the class-weighted indices, independent of the valuation element represented by the sociographic score. Even in a population of twenty-five the correlations are significant.

Age-mate studies show less association between the sociographic score and the indices. The indices, however, parallel one another. A correlation of .89 between the sociographic and class-weighted indices has been found in a population of 204 adolescents. Nearly two years later, in the same research center, the coefficient turns out to be .88 for the IPS_S and IPS_C of 205 young people. Partial correlations have not been calculated for these populations.

Three observations should be made about relations between the two indices. First, each one reflects the relative frequency of positive and negative valuations directed to a subject. Hence there is bound to be a positive correlation with either a sociographic or a sociometric score. Second, there is a residual correlation between the indices independent of frequency of valuations. The working hypothesis is that both indices are incorporating a level of acceptance element—an important objective in originating them. Finally, each index has some free variance which may be attributed to the method of weighting informants' nominations.

THE MEANING OF AGE-MATE ACCEPTANCE

Indices described in the previous sections are investigators' constructs designed to approximate a boy's or girl's level of acceptance among age-mates. The hypothesis is that experiences concomitant with age-mate acceptance have much to do with social learning and shifts in motivational orientation among young people. It follows, then, that changes in peer status through time represent not only potential shifts in motivation but also in the pattern of socialization for an individual.

The relationship between an index of peer status and age-mate acceptance can be illustrated but not demonstrated within the limits of the present introductory paper. Demonstration would require converging data and statistical confirmation from populations in several situations. The relation between the acceptance index, on the one hand, and concomitant social learning, motivational orientation, and behavior patterns, on the other, is a research area in which we have only preliminary findings.

One means of obtaining data "external" to the sociometric valuations and the indices is to undertake focused interviews in the population being studied. For example, a boy who is regarded as a "wheel" is led to talk about an ethnic girl who had been a "mouse" in her early teens and who is now looked upon as an "outsider," active out of school. The boy is upper-middle in family background; at age 14 his peer status index was 3.6; at age 18 it is 4.0, denoting affiliation at level I. The girl, on the other hand, is upper-lower in family status. Her peer status score has risen from 0.4 at age 14 (level IV) to 1.7 at age 18 (level III). The young man puts his valuations into words which explain much about why subgroupings form and persist.

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It seems as though there's an invisible barrier between us. If I dated her it would be an exception to the rule because of the opinion of others. I haven't paid any attention to her so I wouldn't really know if she were attractive. A lot of kids wouldn't think she was attractive. That's silly. If I really knew her, I don't know but what I'd think she's really pretty.

She just hasn't entered into my thoughts and *I wouldn't know how to enter her in*, if you know what I mean. There's too much attention paid to what others in your group have to say about that sort of thing. I wish I could be above such things. But if you try to, it appears as though you were peculiar. You have to go along with the group or you're too far apart, and *if you're too far apart it's not so good*.

The girl referred to in the preceding interview excerpt has talked to a field worker. There is little doubt that she had some appreciation of the patterned relationships in her adolescent society.

I am treated respectfully and courteously. There aren't any comments about me. But there are girls who have groups of their own. I don't associate with them. They have allowances. I have to earn what I get. They go out like on Saturday evening when I have to take care of children. . . .

Mrs. Nelson helps me when I have a problem about what to do. Once I didn't know some girls who wanted me to go to the show and skating. She knew who the girls were. She told me they weren't the type for me. They always go out with boys, and they smoke and drink. One of them had quit school, the other was Mary Smith. So I told them I wasn't allowed to go out nights. I said I had to study. . . .

Parents, other adults, or age-mates frequently are found as models for learning and consulted as guides in day-to-day behavior. Through her adolescent years, the girl has turned more often to adults; the boy, on the other hand, has learned to refer to his age-mates. The girl seems to rely upon adult authority and "wisdom" for advice and direction. The boy is quite aware of, and responsive to, the seldom-expressed but ever-present expectations of "the active group." In this and other instances, learning positions such as those of the "wheel" and the "mouse" have different meanings in terms of perceptions, attachments, and value-apprehensions.

Another illustration of data sets which tend to confirm the indices and indicate usefulness comes from a research center where the sociographic index has been employed. The speaker is a girl who in 1950 moved from a larger metropolis to the smaller Texas community. The girl is in peer status level II and the level of others appears in parentheses.

This is such a friendly place. I wondered how I'd feel from things Kitty (II) had said, but right off I began to know everyone and who they were. At H——, the kids who were in everything were always to themselves. Here, I feel I know George (I), and Clifford (I), Leonard (I) and Cindy (I), Billy (I), Helen (I), Shirley (I), or Joyce (I) just as well as I know

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anyone else. And no one is disliked too much. I know how everyone feels about Olive (V)—and she isn't even here any more. But no one told me I had to feel that way or even why they feel that way. Or Patty (V) too. And one time they were talking about Zeke (V). I don't know him. Since I'm new here, I'm not used to thinking about certain kids being *select*—the way Kitty does—so I like Don (IV) or Kitty, or Fay (II) as well as the rest.

SUMMARY

The paper has reported upon two alternative indices of peer status developed in recent research. The two forms of the index appear to approximate, with a minimum of error, essential aspects of the level of acceptance—or peer status—of subjects in classroom groupings and in age-mate societies. The working hypothesis is that experiences in an age-mate context account for part of the variation in cognitive discriminations, in cathectic attachments, in value-apprehensions, and in resultant categorizations which are characteristic of children and adolescents. Hence level of acceptance could be a variable by which individuals and sub-groupings in a population are distinguished and identified for further study.

Indices are derived from the positive and negative preferences directed by informants (*i*) toward each subject (*j*) according to the general formula:

$$IPS = \frac{PVR_w - NVR_w}{N} \pm \frac{D_w}{N}$$

The weighting (*W*) of nominations may be in terms of a variable "internal" or "external" to the sociometric valuations. In one form of the index, the valuations (PVR, NVR) are weighted by the sociographic level of the informants; in the other form, the valuations are weighted by the rank value of the family status of the informants. The correction factor (D_w/N) takes account of the deviations between informants and the subject. Calculations may be made directly from a sociographic matrix or from data cards which record the sociographic level or family status of informants.

The peer status index is a construct which represents the total valuations made toward a subject by his peers. The index takes account of nominations from others not only at the same sociographic level (or family background) but also at other levels. Hence the variable is useful in characterizing individuals and in studying group structures. The distribution of scores can be employed in research designs where demonstration of hypotheses depends upon statistical analysis. In addition, it appears to be useful to teachers and other professional persons who wish to estimate individual and sub-group acceptance among young people.

Levels of acceptance also can be determined from anecdotal material and interview recordings independently of sociometric data. The procedure takes a great deal of time and organization of the data by an evaluated par-

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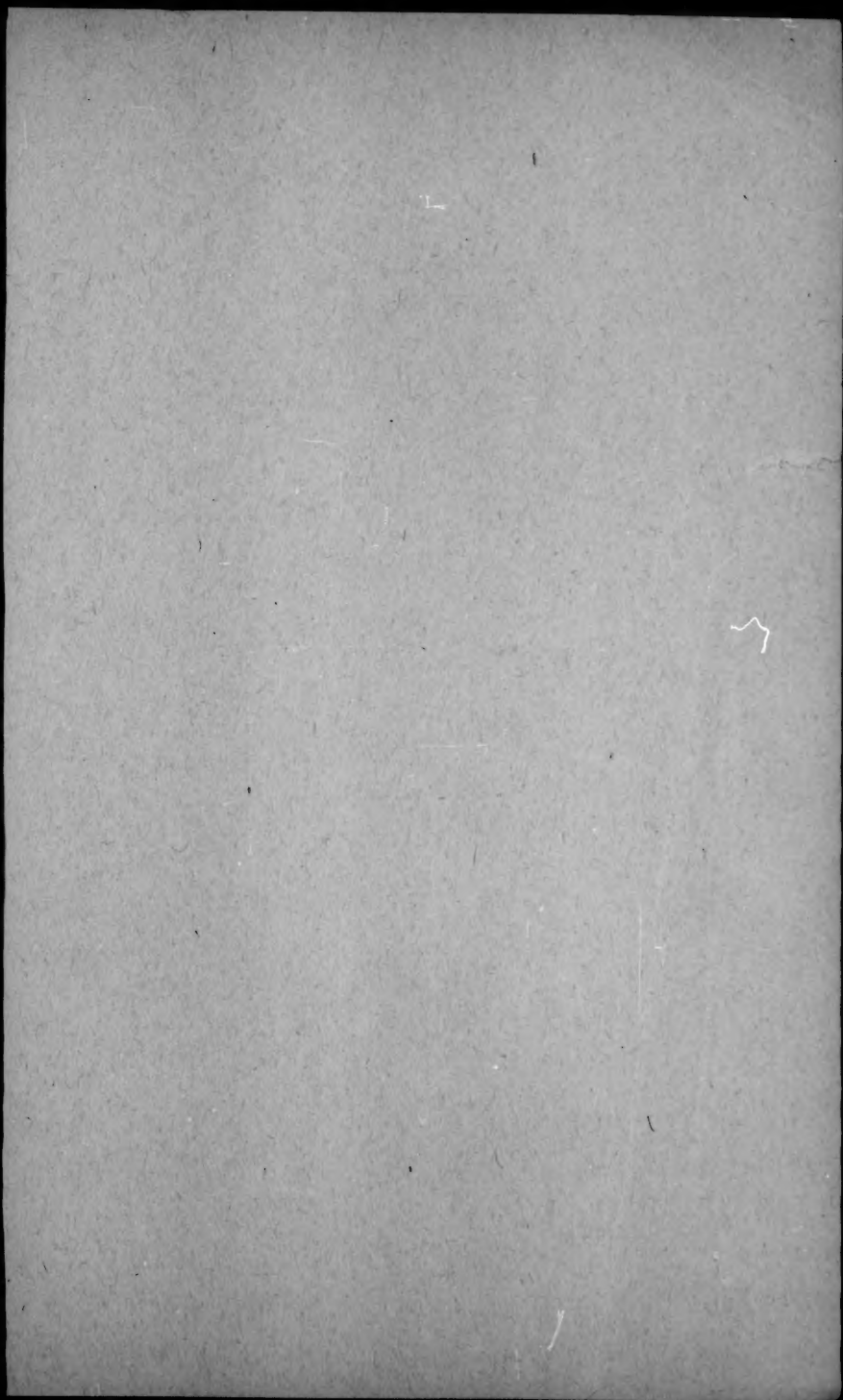
ticipation procedure (7). Indices can be compared with evaluated participation findings to supply data for validation of the construct. Some indications of the kind of information which may be secured to interpret the index are contained in illustrative interview material. Interpretation also depends upon variation and covariation with other variables.

The indices depend, to some extent, upon the composition of the population in terms of age and family background. Despite the status-weights in one form, though, it has been shown that it has a high correlation with the one employing sociographic level as a device for weighting nominations. Unlike most sociometric indices (4, pp. 561-585), the two described in the present paper take account of something more than the mean number of positive and negative valuations involved. As measures of acceptance and concomitant phenomena they seem so plausible and useful that we shall continue to employ them until they are improved or replaced by other constructs.

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